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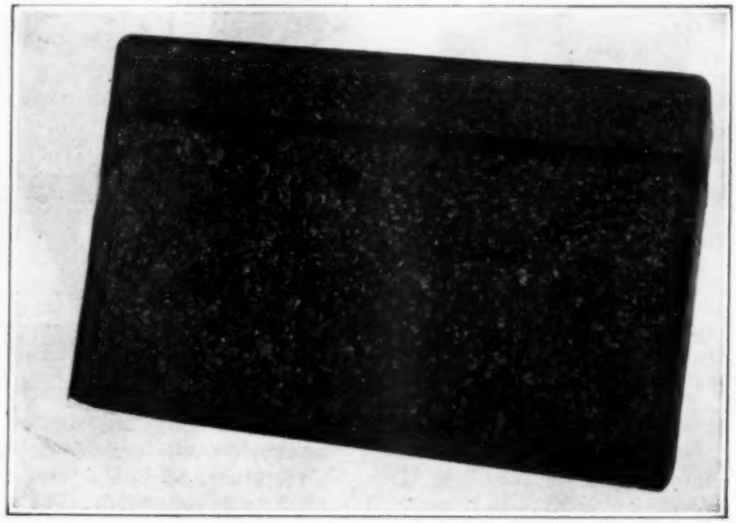
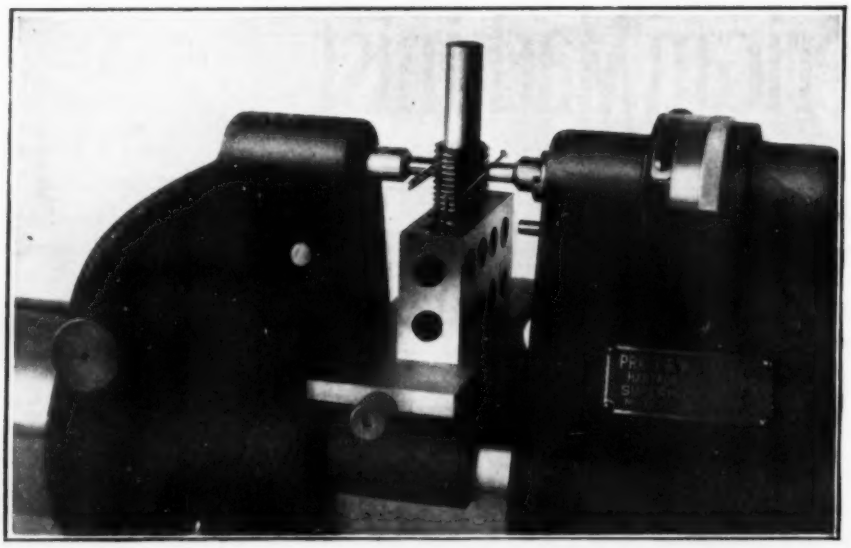
How Crystallized Lacquer Finishes Are Produced

CRYSTALLIZED finishes, more commonly known as "crackle" finishes, have come into favor to a marked degree during the past few years. The medium by which the crackled effect is produced is a special lacquer that, under the influence of mild heat in drying, breaks up into crystals resembling snow flakes on a frosted window pane. It is very sensitive to heat while drying, and the size and texture of the crystals can be varied within a limited range by regulating the temperature of the drying oven and consequent length of the drying period. Short heats at higher temperatures tend to produce smaller crystals. Among the advantages of crystallized finish aside from its pleasing appearance are: it does not reflect light, and is thus peculiarly adaptable to optical and similar instruments; and it does not show up small defects in the surfaces to which it is applied, hence less care is required in the preparatory processes. A drawback that militates against its use for some purposes, notably for automobile finishes, is that its roughness causes it to collect dust readily, though the crystallized surface can be cleaned easily with a damp cloth. Many colors are available and are producible in two ways: by applying a pigmented lacquer of the desired color; or by applying transparent lacquer over an undercoat of colored enamel or electroplate. It does not work well, however, over white or pale colors, bright nickel, etc., though beautiful effects may be secured by lacquering over black-nickeled, bronzed, or oxidized surfaces. Crystallizing lacquer may be applied to surfaces of almost any nature. The surfaces must, however, be thoroughly clean and dry, and if an undercoat of japan or enamel is to be covered it must be baked hard or thoroughly air-dried before the lacquer is put on. While the crystallized finish may be secured by the application of one coat of the lacquer—particularly if the finish is black—more satisfactory results are obtained by enameling and baking the object to be treated. For this purpose any standard enamel may be used, or enamels specially suited to the purpose may be procured from the makers of the crystallizing lacquer. The lacquer may be either brushed on, or applied with an air gun. It must be laid on evenly, whichever method is used. If the gun is used, care must be exercised that no part of the surface is covered the second time, while rebrushing a surface or going back with the brush to pick up a run must be scrupulously avoided. While a crystallized finish can be produced at ordinary room temperatures, much better results are obtained by forced drying in a special oven. This oven may be built of wood or wall-board, as the temperature should never rise above 110 deg. F., and the drying period seldom exceeds 45

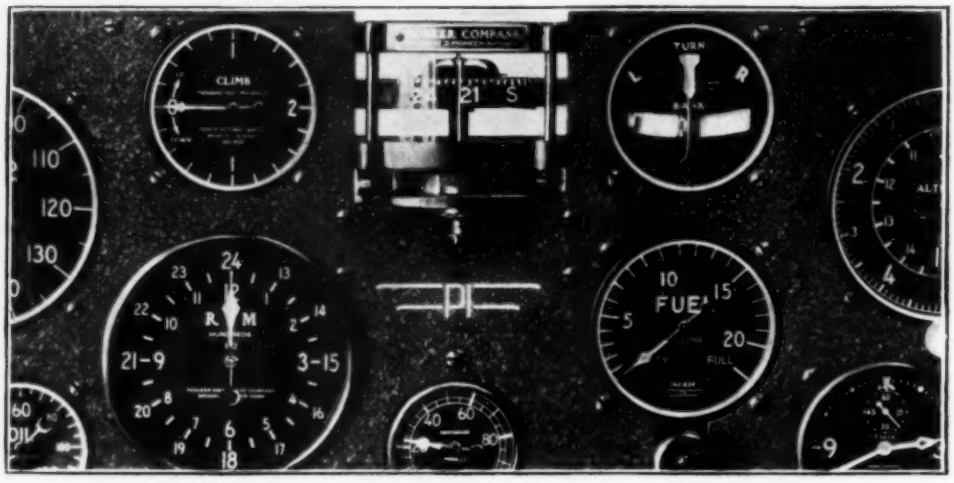


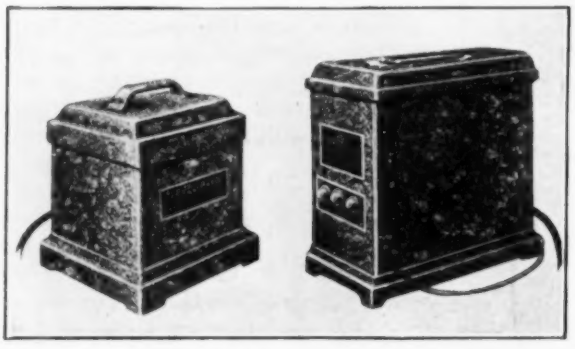
Above: Lamp and shade with crystallized lacquer finish. Below: This box was made of pattern lumber and was painted black with the ordinary paint used on patterns. Crystallizing lacquer was then applied and baked for twenty minutes at 95 degrees. Note that the crystals diminish in size toward the corners of the box



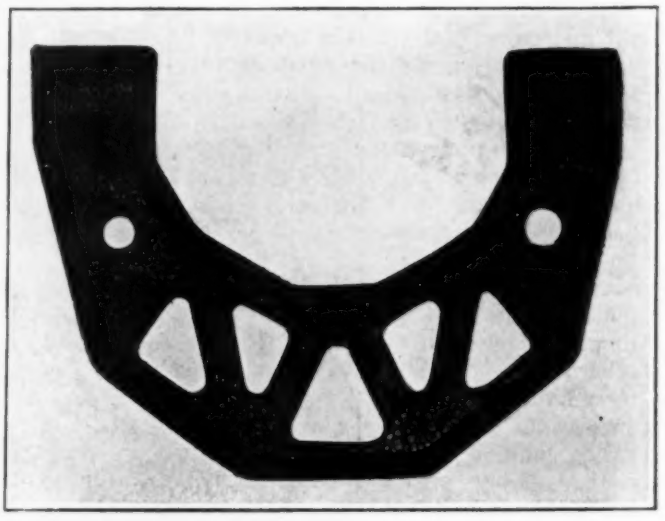
The cast parts of the super-michrometer are finished with crystallizing lacquer. On a precision instrument of this nature it is very necessary to perform the final machining operations after the lacquering is done, as the finish-machined parts could not be subjected to the heat necessary to bake the lacquer without risk of distorting them

This instrument panel for an airplane is made of duralumin. After the instruments have been fitted to place they are removed and the panel coated with enamel, which is baked on in the usual way. Crystallizing lacquer is then sprayed on with an air-brush, or gun, and the panel baked in the special oven to cause the crystal to form





Crystallizing lacquer in various colors makes a very attractive finish for the metal cases of radio apparatus, the appearance of which is a prime requisite



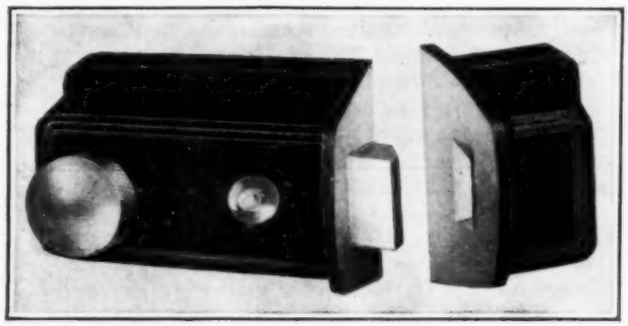
Frames for gages are among the many toolroom adjuncts to which crystallizing lacquer is applied. A neat finish is a distinct asset to a precision tool

minutes. Crystallization of the lacquer is adversely affected by sunlight, or, indeed, by strong light of any kind, and it should be handled only in subdued light. One company that uses the process extensively in connection with its product, has a small room of a size convenient for one man to work comfortably, lighted only by a ruby-colored electric lamp similar to the lamp used in the usual photographic dark room.

A bench along one side of the room—which is also the drying oven—provides a place to lay the work, which is suspended by hooks from overhead racks as soon as the lacquer is applied. The air gun is used in all cases except when the quantity of work to come through at a given time is so small that it does not warrant preparing the gun and cleaning it after the job is done. On such small jobs a hand brush is employed.

The room is heated by a small gas stove, controlled by valves outside the partition. A thermometer is suspended opposite a small, glazed opening in such position that its scale can be read from outside. When the painter has completed the lacquering upon a batch of work and hung the several pieces on the rack, he lights the gas, goes out and closes the door. By watching the thermometer while manipulating the gas and air valves, he regulates the temperature in the oven, and allows it to remain stationary at the desired heat for the required drying period.

Temperatures range from 95 to 105 deg. F., and the drying time from 20 to 45 minutes, depending upon the size and nature of the objects. Other things being equal,



Lock cases, when exposed, may add to or detract from the beauty of the home wherein they are used. Crystallizing lacquer in colors to match the woodwork disguises the utilitarian aspect of these and other necessary home fixtures

large objects require longer time than small ones; metallic objects require longer time than those of wood, or similar material. To produce small crystals the upper limit of temperature is applied and the drying forced.

Gas heat seems to be essential to good results, the theory being that the gas flame burns out the oxygen in the room and leaves a neutral atmosphere. Probably keresene, candles, or any open flame would bring about the same result, though these would be difficult to maintain in a room practically devoid of oxygen.

The work must be protected from drafts of air while under heat and for that reason if no other the gas stove is the best means of heating, as the air necessary to support combustion is admitted through a pipe directly to the burner and the oxygen consumed immediately so that no cooling takes place.

At the expiration of the desired heating period the heat is shut off and the oven remains closed over night, or for a time sufficiently long to allow the work to cool thoroughly. When cold, the work is transferred to an electric or gas oven of a standard type and baked for three hours at a temperature of 250 deg. Fahrenheit, as a general rule.

This time and temperature is not arbitrary. Higher heats for shorter periods or lower ones for longer periods may be employed. The temperature should not be allowed to rise above 350 deg., however, and when the lighter colored lacquers are employed the temperature should be held at not much over 150 deg. for a period of about four hours. High heats cause the lighter colors to turn yellow.

The information in this article was obtained from the Pratt & Whitney Company, the Hilo Varnish Company, and the Pioneer Instrument Company.

SEEN · AND · HEARD

By John R. Godfrey

Blue Mondays, Romance and Oil

ROMANCE and machine production don't usually mix to any great extent. But I ran across a case the other day that sounds like an old-time story in some magazine. I was visiting a friend in a good-sized shop and after one of his outside "trouble men" had gone out he said, "Kind of queer about Bill there. When I first came here Bill was a regular blue Monday absentee. Always got pickled Saturday night and had a hangover Monday. I told the foreman to fire him.

" 'Sorry Mr. Jones,' he said, 'but I just can't do it. You see Bill is the best man in the shop. I can put him at any old thing and he'll do it—and do it right—after he sobers up. Rather have Bill five days a week than any of the rest of them for all six. Some day he'll get on to himself and be the best man we've ever had, all the time.'

"And he was right, too, Godfrey. Bill got sweet on a girl here in town, sobered up, never touches the stuff, and he's the best outside man in seven counties. Sounds like a fairy story, I know—but the foreman was right —and I'm glad I kept him."

This isn't a plea for Monday morning absentees, nor a suggestion to establish a matrimonial agency in the shop, but there seems to be times when it pays to stretch the rules a bit.

* * * *

I've had more or less to say about lubrication at various times. And it is very gratifying to notice that more attention is being paid to the oiling of machinery in various quarters. Not that the idea originated with me, but sometimes the distributor helps to market a product more than the originator.

It's been common knowledge for many moons that lack of oil at the right place is probably responsible for more machine failures than any other single cause. Squirt cans still remain the main oiling system in too many cases, using oil cups or pipes in most instances to be sure.

Splash, or flood lubrication has long held sway in some vertical boring mills and in milling machines. Geared heads and other units that can be enclosed are also usually well lubricated. But there are many bearings that still receive scant attention in too many machines. For getting oil to just the right place and in just the right quantity, is not an easy task.

This makes the announcement of a new automatic machine with a forced feed oiling system that reaches 56 bearings, doubly interesting. Theoretically at least, each bearing gets just the right amount of oil it needs and no more. But it's clean oil and it goes in regular doses. But wouldn't a machinist feel lost without a squirt can?

What counts in a man is not what he can do, but what he does and how he does it. If a man does not offer his best services, he is holding himself back.

The operation of a business is similar to a motor in that you cannot take more out of it than you put into it.

Taking on a Side Line

R. J. HARTWELL inherited the Hartwell Machine Company from an old uncle who thought he was doing him a favor. The concern made money in the days before competition had reached its present stage, but just at present the shop is more of a liability than an asset. One of Hartwell's friends had told him how Mr. Holland had helped out another shop—so Hartwell had asked him to come and look the place over, and tell him what sort of work he could take on as a side line.

After they had spent an hour in the plant and were back in the office Hartwell began to ask questions.

"Now, Mr. Holland, you've seen our plant and equipment. What do you think of it and what sort of product can we take on as a side line to make some money?"

"The equipment is pretty bad, Mr. Hartwell. May have been good once but that was a long time ago. Not that some of the machines are not in fair condition, but they are so out-of-date that no one but a job shop man would take them as a gift. But just why do you think you want to take on a side line?"

"No money in wrenches of this kind, Mr. Holland. Too much competition. Got to get some side line that will fit in with our equipment so we can make some real money next year. Do you know of any sort of tool or appliance we can take on?"

"Seems to me you're looking at things from the wrong angle, Hartwell. You say you can't compete in your own line of work and yet you expect to make a lot of money by shifting your product."

"But I want some line where the competition isn't so bad as in wrenches. Some lines have a big margin of profit, I'm sure."

"I'm afraid you are fooling yourself, Hartwell. Your men know wrenches and if you had modern equipment you might make some money on wrenches. What I don't see is how you can expect to use antiquated machinery to make anything else at a profit."

"But I don't want to spend a lot of money for new machinery when I don't know whether I can come back in the wrench game or not, Mr. Holland."

"Are you sure, Mr. Hartwell, that it won't cost you as much to take on a new line as to go after the old one right? Remember you've got to spend money in introducing the new line to your trade, or to some new trade; you've got to spend money rearranging your shop a bit; making new tools; and in other ways."

"Are you advising me to forget any new line and devote my time and money to the wrench game, Mr. Holland? I'm not so keen about that."

"I'm not advising anything, Mr. Hartwell. I've just pointed out a few of the things to consider if you do go after a new line. I'm also just giving you the experience of a friend of mine who was up against a similar problem only last year.

"After studying it over very carefully he decided that it would be cheaper to revamp his equipment and go after his old trade. He knew his customers and his men knew the product. So instead of spending money in new and unknown lines, he decided to stick to his own line—and he won out."

"I hadn't looked at it just that way, Mr. Holland—but perhaps you are right."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

New Equipment vs. Expansion

To expand or not is the problem of George Brower. A vital fact in this problem is missing: that of product. What does he fabricate? What are the marketing possibilities? Does he fabricate

articles for other customers? In other words is there a constant demand for his product? Do we anticipate an increase in demand in the future? In my estimation these factors are very important in solving this problem.

Evidently Mr. Holland was familiar with product, therefore was in a position to advise George Brower. The reader, not being familiar with product or demand, really is not in a position to solve this problem.

Mr. Holland's suggestion or recommendation in regard to increasing capacity is fine. He also is right in regard to over-expansion, which has ruined and is still ruining a large number of small and medium-sized plants. By all means, wherever possible, equipment should be the most modern obtainable.

A small plant kept busy constantly, operating at a profit with a minimum overhead, is preferable to a large plant with a heavy overhead, constantly scrambling and begging for business.

—PAUL LINDNER.

To Move or Not to Move

The time to move is when business has increased to a point where lack of necessary space compels the use of larger quarters.

Let's suppose that just one year ago Mr. Mason was informed of an empty building that could be rented for a sum less than his present rent by an amount equal to the recently announced increase. Let's also assume that he could take advantage of this offer being bound by a monthly lease only.

It's dollars to doughnuts Mr. Mason would have spurned the offer. His decision, no doubt, would have been based on the realization that the shop and its location were well known to his customers and that to move without first thoroughly acquainting the trade of his intentions would have reacted unfavorably on business.

The matter of increased prices for materials, transportation, etc., offers no serious hindrance to locating in another section, but the abandonment of the main source of work for the shop is not to be treated lightly.

—SAMUEL KAUFFMAN.

Charging a Profit on Material

The question of whether or not to add a handling charge to the purchase price of material is dependent upon so many factors varying greatly in different plants that it would be impossible to formulate a rule that would apply equally well to all plants.

One of the most important factors to be considered is the relative cost of material, labor and burden entering into the total cost of the product. If the cost of the labor is small as compared to that of the expenses incidental to handling and storage of the material, it would undoubtedly be necessary to make some manner of account of the "real cost" of the material on the cost sheet. If this large relative cost of handling and storage were typical of the entire product being manufactured it could easily be included in the overhead charge at a considerable saving of clerical time. However, if the large handling charges were only incident to the material used in a small percentage of the entire line of products, they should be added to the purchase price of such materials in order to obtain the "real cost."

Another consideration that should not be overlooked is the average length of time that capital is tied up in material before the material is actually disposed of in the finished product. If the interest on the capital so invested is large enough to warrant the clerical work involved, it should either be included in the overhead or in the cost of material.

Before proceeding definitely with a plan in any plant some analysis should be made as to the relative importance of the various factors entering into the total cost of material as compared to the total cost of the product and as to whether or not these factors were fairly general for the entire line of products being manufactured. Then if the expense of handling, storing, interest, etc., of the material seemed to warrant it, some method of calculation should be adopted that would be consistent with both the value of the result and the cost of the clerical time.

—W. L. ROMICK.

A manufacturer obviously sells his customer material that has been fabricated, and whether this fabrication is simple or complicated—and requires little or tremendous facilities in the way of equipment, engineering, etc.—the buyer actually purchases the material in its finished state and rarely interests himself in the way or why of manufacture.

Selection of the right materials for strength, weight and general utility is a matter of great importance and the result of years of experimentation is reflected in many products sold.

True, many expenses attach to the procurement of materials, such as engineering, buying, trucking, freight and express, storage, handling, but, due usually to the great varieties of materials purchased, it has been found impractical to allocate such expenses to cost of materials for purposes of getting direct charges to each and every fabricating order. Hence, some method of overhead distribution is used whereby these charges get into the cost of products manufactured.

Selling price and profits are usually computed on total mill cost of fabricated article, with sufficient allowance for administrative and selling expenses—and by this method profit is charged on material as well as the fabricating costs—and

rightfully so. Incidentally, I think you will agree that most manufacturers invariably speak of profits in relation to percentage of sales. I cannot recall any occasion when, before such computations were made, the sales were reduced by the material factor. —A. E. NORTH.

How Much Shall the Proprietor Draw in a Small Shop?

Theoretically Mr. Holland is entirely right in his advice to Jack Shepard to charge for every item of expense, including his own labor of every kind, and that "there's no sense in working hard and barely making a living." However, if this advice is followed literally a number of promising shops may have to close down and some ambitious men who contemplate starting up for themselves may be discouraged. It is often necessary to start in such a small way that a man is lucky if he can even get a living out of his business for a year or two. Some shops started in this way have grown into large concerns.

Many of the older readers of the *American Machinist* will be able to remember the start of a business which is one of the leaders in the country today and which is so sound that its five per cent bonds sell above par. For a time this business was so small that the owner could not get a living out of it and his wife had to work in order for the family to live. This man left several million dollars when he died, but if he had followed Mr. Holland's advice he either would never have started in business or would have closed down after a short try.

Of course every item of expense, including a salary for the owner, should pass through the books in order that he may know exactly where the business stands and whether or not it is worth while to continue; but if the business is moving in the right direction and shows promise of becoming worth while he should not close down simply because he cannot get out of it at first an adequate salary for himself. Some sacrifice is quite likely to be necessary, just as it is when a man takes on a new job. —C. J. MORRISON.

The owner of a jobbing shop employing about forty men asked us to help him establish a new hourly-rate charge. His profits did not seem to be in proportion to the work he turned out and the investment he had in equipment. He was making merely a fair living, getting an income which he could have earned working for any large corporation, without having any capital invested.

The following facts were brought to light:

1. The regular hourly rate was $1.50.
2. The highest rate of pay was $0.95 per hour.
3. The lowest rate of pay was $0.40 per hour.
4. The average rate of pay was $0.70 per hour.
5. The total investment in equipment was $80,000.
6. He had machines ranging in cost from $10,000 down to $250.
7. In the year previous the owner had taken the sum of $4,500 from the business.
8. The owner thought he was entitled to a larger return and wanted to know how to get it.

We arrived at the following conclusion:

1. That the services of the owner were worth at least $4,000 per year.
2. That a fair return on the investment would be 10 per cent, or $8,000.
3. That the owner of this business was entitled to a clear profit of $12,000 per year for his investment and his time.

This owner had figured the depreciation on his equipment at 10 per cent and had accordingly deposited $8,000 in his sinking fund for the year. His operating expenses were paid before he took any money out of the business for himself.

From the books we found the following figures (approximate only):

Total number of hours worked	60,000
Total cash received	$93,000
Total wages paid out	43,500
Depreciation (deposited in sinking fund)	8,000
Rent	3,000
Power, office help, trucking, heat, light, incidentals	34,000
Owner	4,500

Using these figures as a basis for calculations we suggested the following estimate:

Total business, hours	60,000
Total wages	$45,000
Depreciation	8,000
Rent	3,000
Power, etc.	35,000
Owner	12,000
	$103,000

$103,000 divided by 60,000 equals $1.72. In other words, the total expense divided by the total number of productive hours gives the proper charge per hour.

This owner is now charging $1.75 per hour for his work and is getting just as much business as he did at $1.50. He lost a few customers who were buying for price alone, but the majority of his old customers are still with him.

It is evident that a comparatively small variation in the price charged for work in a small shop can either make or break the owner. As there is no profit to be made by trading dollars there is no object in doing job work at cost. The small shop producing high quality work has nothing to fear in charging a fair price for its product.

The small shop, in order to stay in business, must establish a reputation for fair dealing, high-quality work, and prompt deliveries. Once this reputation is established, almost any reasonable price can be charged for work.

Speaking in terms of dollars and cents, there are two sure ways of a small shop owner going broke: the first is to charge so little for his work that he loses money on every transaction; the second is to charge so much that no one will buy his product. Of the two, the latter is to be preferred. —G. I. DAVIS.

Connecting Rod Methods in the Lancia Plant

By J. A. Lucas

Boring and grinding the bearings—Milling, broaching and reaming operations—Gages for inspecting the bearings for parallelism and the rod for twist

THE rods now go back to the three-spindle Cincinnati-Bickford machine shown in Fig. 3 in the first part of the article, Fig. 13 showing the fixture in detail. Here the large ends are rough bored, using a three-tooth cutter that is piloted in the fixture. The method of clamping and locating is shown. About 0.002 in. is left for grinding. While one rod is being bored the second rod is put in place. After boring the first rod, the fixture is swung so as to bring the second rod under the boring spindle. The holes are finished by grinding on the Naxos machine shown in Fig. 14. This machine is of the planetary type, the belt drive being somewhat differently arranged than on the same type of American machines. The rods are positioned by the plug *A*, which fits the guide *B* and locates them by having the smaller end *C* go through the bored holes. A close up of the grinding fixture is shown in Fig. 15. The fixture is unusual, in that two rods are held so that the crankpin holes in both of them can be ground at one setting. The rods are located by the piston-pin holes and by the plug *A* shown in Fig. 14, and are clamped on the faces of the hubs. The grinding of the crankpin holes in the forgings has been only recently introduced, but is found to afford more satisfactory seats for the bearing shells.

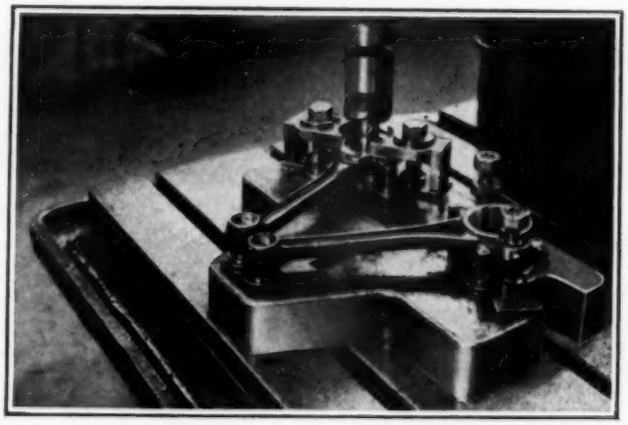


Fig. 13—Boring the large ends of connecting rods. This is the second operation performed on the machine shown in Fig. 3, the fixture holding two rods, one being put in place while the other is being bored

The connecting rods go back to the three-spindle drilling machine for another operation, as shown in Fig. 16. Here a hollow mill finishes the outsides, or hubs, of the small ends. No special methods of location are necessary, because the hollow mill is piloted inside the pin on which the small end is located.

A somewhat unusual operation is shown in Fig. 17, where the oil groove is being milled across the end of the wristpin end of the rod. The fixture holds two rods, one on each side of the central web. The rods are fed up past the milling cutters, producing the groove as shown at *A*. The milling time is one minute. Oil holes are drilled in both ends of the rod in a machine that has been improvised from a lathe, Fig. 18. Each drilling head is motor driven, and both drills are fed simultaneously by hand. The method of locating the rod can be seen. The small end of the rod is milled by the formed cutter, as in Fig. 19, the swing of the rod being secured by rotating the table by the posts shown. The cut is taken about three-quarters of the way around the end. The hole in the small end is finished by broaching, the method of supporting the work and of keeping the various broaches in a convenient position being shown in Fig. 20. The final reaming of the crankpin bearing is done by hand in the fixture to be seen in Fig. 21. This view shows how the rod is located by the piston-pin hole and is supported on the two points *A*. The clamp *B* bears on points opposite these supports, and the reamer is very carefully guided by the large bearing at *C* and also by a pilot that enters the fixture itself. This view also shows how the various reamers are held in readiness for use. Similar outfits are supplied to service stations where Lancia engines are overhauled.

The sides of the bearing are finally faced in the fixture shown in Fig. 22, by the simple facing cutter *A*, which is adjusted to the cut by the knurled nut *B*. The snap gages to be seen on the fixture determine when the length

Conclusion of the article.

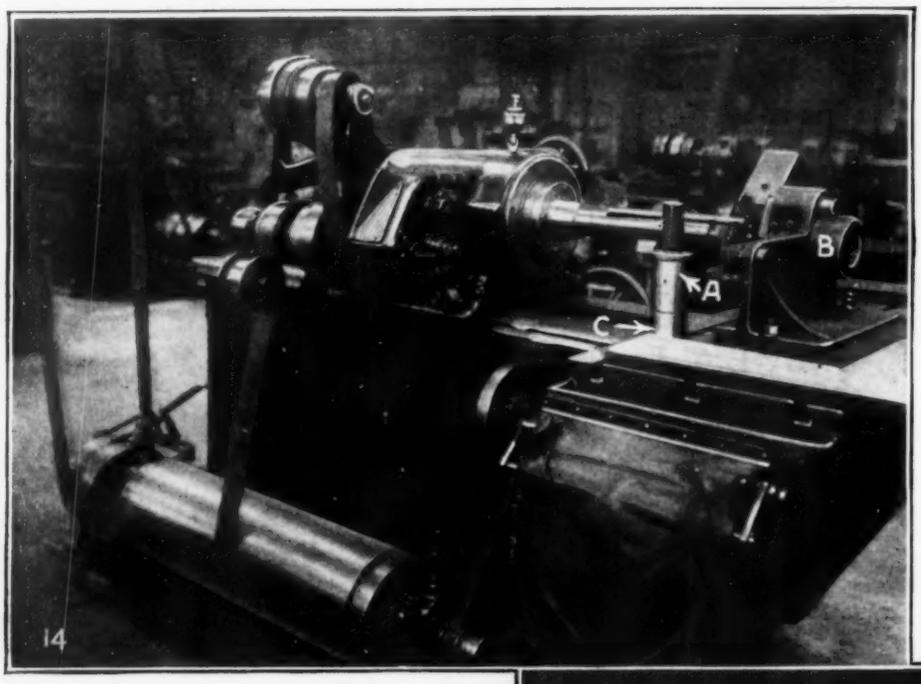
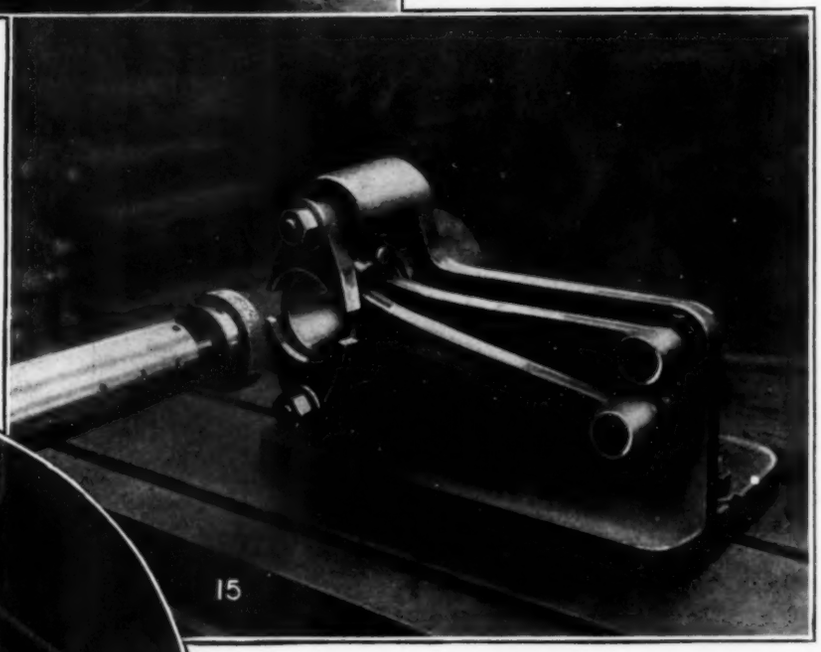


Fig. 14—Grinding the large ends of two connecting rods at once. The machine is a Naxos grinder of the planetary type, although its construction differs considerably from those used in this country

Fig. 15—Fixture for holding connecting rods to be ground. This fixture is unusual, in that it holds two rods to be ground at the same time. The small ends are located on suitable studs and the large ends are held by the clamps shown



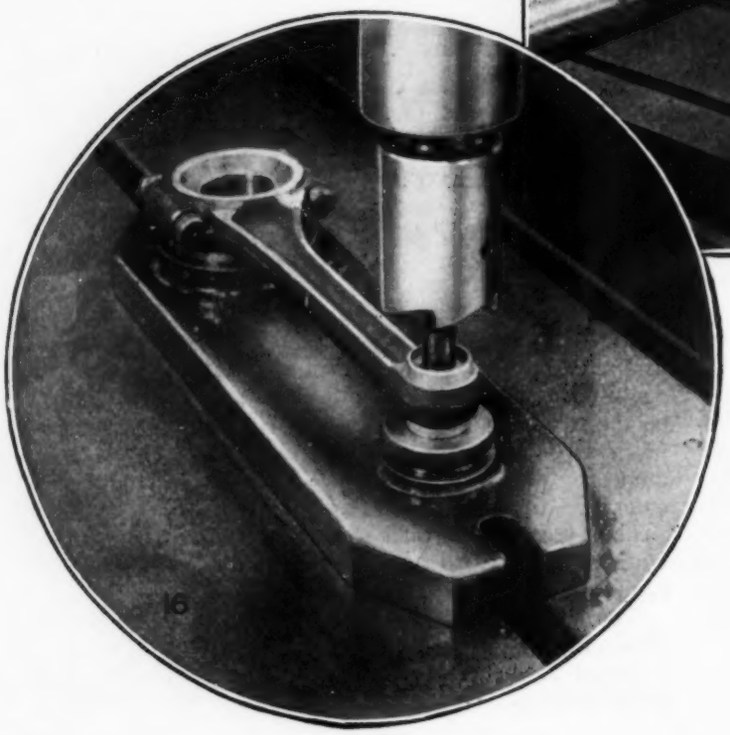


Fig. 16—Finishing the outside of the small end of the rod. This operation is one of hollow milling, the hollow mill being guided by a pilot on the inside of the stud that positions the small end of the connecting rod. This is the third operation performed on the machine shown in Fig. 3, in the first part of the article

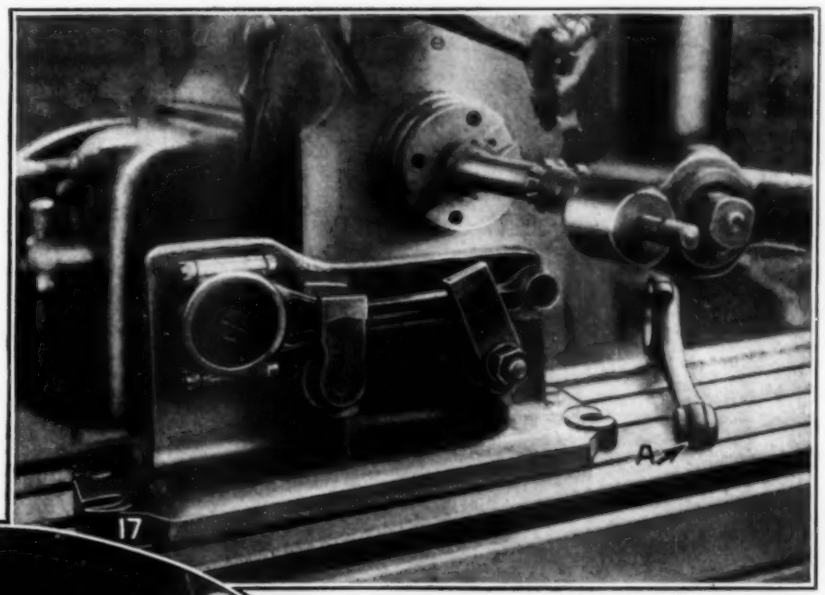


Fig. 17—Milling the oil slots in piston-pin end. This fixture holds two connecting rods, one on each side of a central partition. Formed cutters are used and the slots are milled in each rod at one vertical pass of the cutters

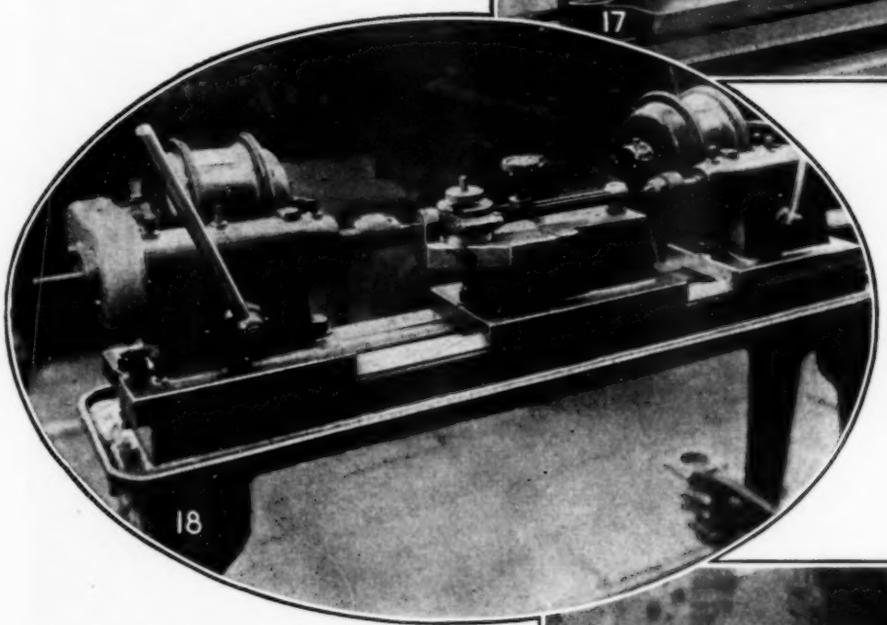


Fig. 18—Drilling oil holes in each of the bearings. The rod is held on the fixture shown, and both oil holes are drilled at the same time. Each drilling spindle has an independent motor and a separate hand feed

Fig. 19—Finishing the outside of small end of connecting rod. The formed cutter mills the small end of the rod down to the surface left by the hollow milling

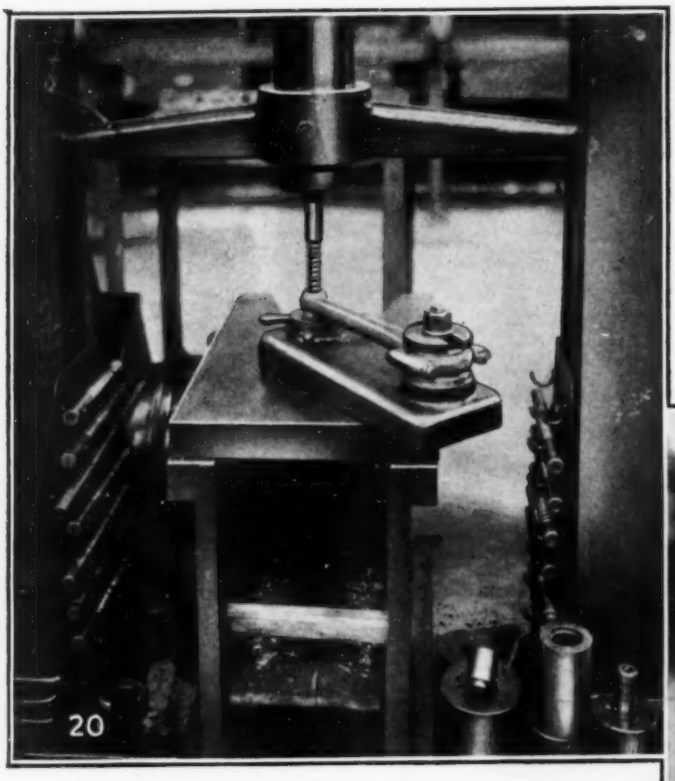


Fig. 20 — Broaching the small end of connecting rod. This view shows the fixture the supporting block, and the convenient racks on each side where the various broaches are kept in readiness for use

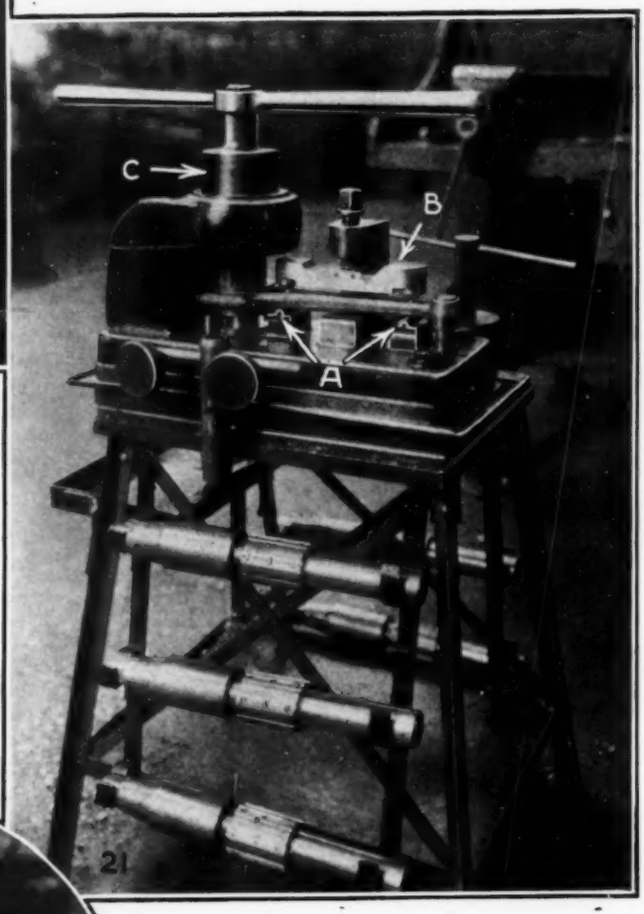


Fig. 21—Hand reaming the large end of connecting rod. Note how the connecting rod is supported for this operation. With the small end positioned on a pin, the rod is supported directly over narrow edges by the floating clamp shown. The reamer is guided in a large bearing

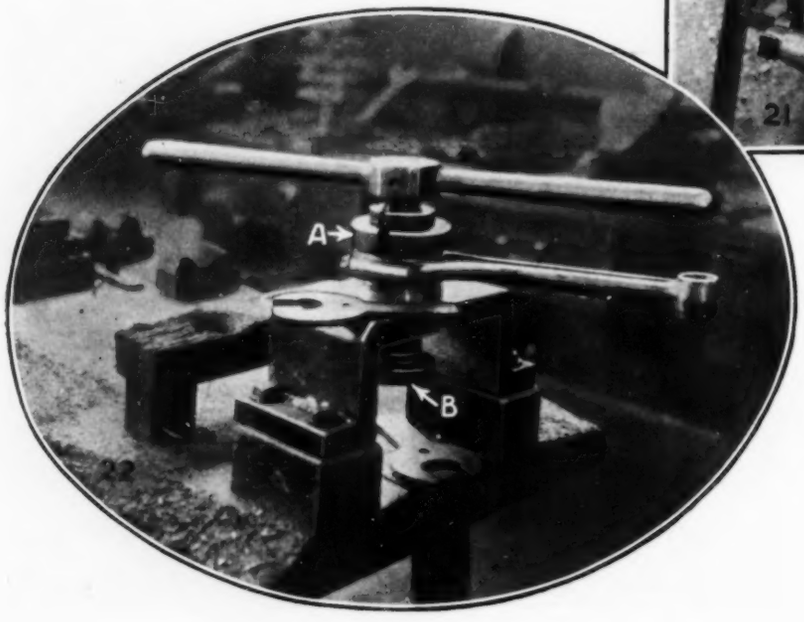


Fig. 22—Facing the sides of the crankpin bearing. Here the rod is held on the special fixture shown, while the facing cutter is operated by hand until the thickness of the rod is brought within the limits indicated by the snap gages shown. A large knurled nut underneath allows the cutter to be fed into the work

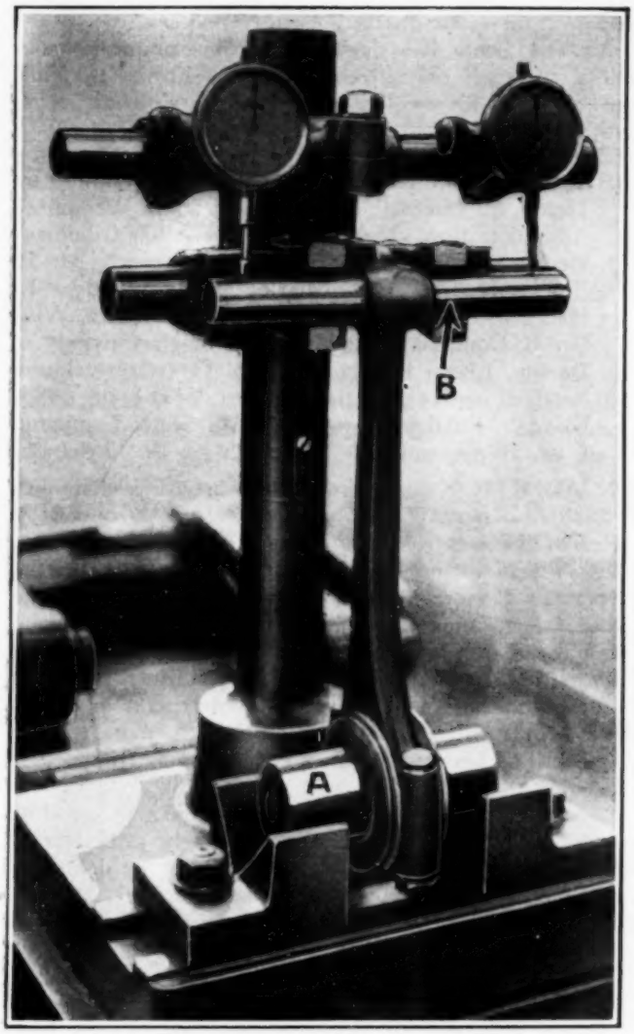


Fig. 23—Checking the squareness of connecting rod holes. The large end is mounted on a test mandrel that rests in V-blocks, while the test bar through the piston-pin hole is brought under the dial gages. While this method is very similar to that used in this country, it differs as to the method of supporting the rod during the inspection

of the hub is correct within the desired limits.

Inspection of the rods for squareness follows the usual custom, excepting as to the methods of mounting the large end of the rod. Instead of being mounted on a fixed stud, a mandrel is put through the bearing, as at *A*, Fig. 23, the ends resting in V-blocks while the test bar *B* is swung under the dial indicators shown. The indicators are here shown in a vertical position but they can be rotated 90 deg. so as to indicate the squareness of the test rod in the other direction, or, as commonly known, to detect any twist in the rod. New inspection fixtures are being designed that will carry two sets of gages at right angles, to check parallelism of the bearings and twist of the rod at the same time.

Weight is an important factor in securing the desired balance, and the method of weighing is shown in Fig. 24. Two scales are employed, each being equipped for holding one end of the rod. This method gives not only the weight of the complete rod, but also the distribution of

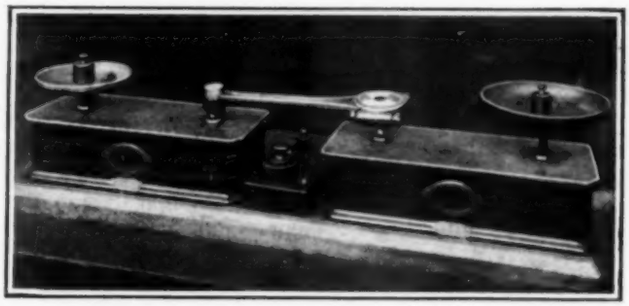


Fig. 24—Weighing the rod on two scales. This method is not only to determine the weight of the rod, but to see that the weight is distributed in such a way as to secure the best balance in the completed engine

weight, and is quite an important factor in securing a smooth running engine. The rods are supported on small points that bear inside the plugs in each end. This method avoids and cramping or bending that might affect the accuracy of the weight.

Boring and Finishing Cylinders

CYLINDERS continue to be an interesting subject for all automobile production engineers. The interest begins with the designing as it affects machining operations, and ends when the cylinder block is ready for assembly. In between come many factors, the quality of the iron as to both cutting and wear, the methods of boring, reaming, grinding, lapping or honing as the case may be.

The proper position of the cylinder for boring is open to discussion. Many advocate the vertical position so as to obviate sag of the boring bar and to allow chips to be easily disposed of. Some prefer the horizontal position so that boring bars can be guided at the outer end. This method requires more time in setting the work although at least one builder uses a removable guide bar to facilitate the setting up of the block. A vertical machine, where the bars come up through the table, has been used in some cases.

Boring is usually done with two or more cutters and the metal is removed very quickly. A few production engineers use the single point, or fly cutter, believing that in this way the bore is cut more nearly straight and true, and is less affected by the variations of the core.

Following the boring operations, no matter by which method carried out, two or more reaming operations are performed, after which the real finishing begins. Much depends on the surface left by the reamer—and reaming has many variations. The reamer must not only be accurate but it must remove any inequalities left by the boring, especially if the grinding operation is omitted.

Lapping, or honing, the methods of finishing cylinder bores now most in use, are primarily designed to give a smooth surface and not to correct inaccuracies. In fact, it is contended that neither lapping nor honing will correct out-of-roundness in a bore, and that accuracy depends on the reaming. Some advocates of the rigidly-held hone claim, however, that while the reaming should be as accurate as possible, a good hone will correct slight inaccuracies in either roundness or parallelism.

· BOOK · REVIEWS ·

SPUR GEARS—DESIGN, OPERATION, AND PRODUCTION. By Earle Buckingham, associate professor of engineering standards and measurements, Massachusetts Institute of Technology. Four hundred fifty-two pages, 6x9 in., cloth board covers. Indexed. One hundred ninety-three illustrations. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York. Price $5.

AS THE author states in the preface, the purpose of the book is to bring out as clearly and simply as possible the fundamental characteristics of spur gears so that more effective use may be made of the facilities now available for producing them. The treatment of the subject is from a mathematical viewpoint, but sufficient explanation is included in the text so that a grasp of the subject may be obtained without following through all the mathematical proofs. For this purpose many tables have been included to simplify actual field calculations.

The entire mathematical structure is built upon the fundamental characteristics of the involute curve, and since the term tan $\alpha - \alpha$ frequently occurs, a complete table of values of this expression is given from 0 to 60 deg. in steps of 1 min., known as the involute functions of α. All problems are solved by means of this table. The problems treated are all practical ones that arise in the manufacture and measurement of spur gears.

As might be gathered from the title, the book treats only of spur gears of involute tooth form. It is divided into three parts: design of gear teeth; gear teeth in action; and machining and measuring gear teeth. The first part is divided into five chapters. The first chapter discusses the general case of conjugate gear tooth action, and the next two, the involute curve and involute trigonometry, referred to above. Chapter IV discusses standard gear tooth forms with particular reference to sliding conditions, while Chapter V treats of the possibilities of various combination forms. The author recommends a range-cutter, proportional center distance system.

The second part is concerned with gear noise, lubrication, loads, strength and durability. The latest experimental data are made available, and all load theories are discussed impartially. The last four chapters treat of the measurement of gear teeth, hobbing of gear teeth, shaping and grinding. A very complete treatment is given to the subject of the relief of both hobs and shaper cutters, a most complex subject, but one that the author has apparently mastered.

HOW'S BUSINESS?—INDUSTRIAL CONTROL BY GRAPHS. By A. L. DeLeeuw, consulting engineer. Two hundred and two pages, 5½x8 in., cloth boards. Published by the Codex Book Company, Inc., 461 Eighth Ave., New York City. Price $4.

HERE is a book that tells why the use of charts is a necessity, how they are used and how constructed. It is not a big book and the author does not go in for complicated charts, yet the information furnished should answer all of the chart requirements for the average business.

Included among the subjects treated by charts are the recording and comparison of sales, profits, purchases, amounts of stock, labor turnover, production and its efficiency. Other subjects are the comparison of the individual business with business in general and the comparison of departments, branches, agencies, outlying stores. Sixty-four charts illustrate the book.

Mr. DeLeeuw has made use of his unquestionable ability to reach his objective by straight-line thinking and to carry his readers along by the simplest steps, logically presented.

BUSINESS MANAGEMENT AS A PROFESSION. Edited by Henry C. Metcalf, director, Bureau of Personnel Administration, New York City. Contributors: Henry S. Dennison, Walter Rautenstrauch, M. P. Follett, H. S. Person, Charles R. Mann, Edgar L. Heermance, A. B. Wolfe, William E. Mosher, Wallace B. Donham, Albert Edward Wiggam, Ernest R. Burton, Erwin H. Schell, H. A. Overstreet. Three hundred and eighty-three pages, 5½x8½ in., cloth boards. Published by the A. W. Shaw Company, Cass, Huron and Erie Sts., Chicago, Ill. Price $6.

IN ADDITION to its impressive list of contributors this book needs little introduction. It is one of a series of volumes resulting from a "Course for Executives" given annually for the past four years by the Bureau of Personnel Administration. Mr. Metcalf, the editor, states that the volume is the result of much original research and creative thinking on the part of its authors. It represents, he says, a unique effort to analyze the fundamentals of business administration and help develop the professional status of business management. The truth of these statements is obvious as the book is read.

It is the reviewer's opinion that management, good as it is today, has much to learn relative to the principles of management; that there is a real need for the definition of and instruction concerning those principles. "Business Management as a Profession" can be of great aid in achieving the knowledge now lacking.

THE AUTOMOBILE INDUSTRY. By Ralph T. Epstein. Four hundred and twelve pages, 6x9¼ in.; 25 illustrations, 52 charts and 1 table. Published by the A. W. Shaw Company, Chicago. Price $4.

THE author has evidently made a careful study of the economic and commercial developments of the automobile industry since its beginning and the book attempts to trace the growth so as to present the various factors that have materially affected it. Manufacturing methods and processes are discussed only as a background for the understanding of market and financial developments. An interesting feature of the book is the large number of references, 207 to be exact, giving the authority for the various statements made.

The halftone illustrations showing the developments in automobile design and appearance as well as interiors and exteriors of some of the plants, are not good examples of the engraver's art and are of minor importance. The various charts, however, show the different phases of the industry over the entire period and will be found extremely interesting to those who desire to make a detailed study, either from the standpoint of history or with the desire of securing some idea as to the future. There is also a very complete list of the various firms engaged in automobile building since the beginning and much valuable information for those who are statistically inclined.

Selling or Dickering?

By D. C. WRIGHT

Shop equipment, unlike canned and package goods, cannot be sold at advertised prices, but the same good will held for branded goods sold at advertised prices can be built up for shop equipment and its producers by having the same "asking" and "selling" price

READING over the trade notices in the *American Machinist* for the past few weeks, and chatting betimes with various men who are actively concerned in the manufacture or disposal of machine equipment, I am led to believe that for one reason or another the market for the larger type of tools is far from showing the activity desired, and confidently expected as a reaction from the recent complete and interesting exhibitions at Cleveland, Detroit and other points.

In fact, it is my understanding that, while inquiries are fairly numerous, the actual number of these inquiries which culminate in sales is very unsatisfactory.

On the other hand, I do know just among my acquaintances of a number of impending purchases and a still greater number of cases where an actual desire to purchase is present, but definite action is being withheld because of uncertainty as to the future of the tool market from a price standpoint. Personally, I am frank to say that my contact with machinery salesmen has equipped me with all of the trading instincts and propensities of an Asiatic. In other words, a formal proposition serves merely as a starting point for an intensive program of bargaining. And, by the same token, the results have invariably justified the effort. Now such a thing is all wrong as it relates to both of the principals in a trade, for at best it is unbusinesslike and time-consuming. However, the real harm lies far beyond the range of any single deal in the general air of distrust which the practice is creating in the minds of the purchasing public and which makes the individual skeptical of the honesty of a proposition even after he has finally beaten or haggled a low price out of a seller.

This article should not be taken as representing universal practice in selling machine tools. Although many builders and dealers sell at one price only, there are sellers who have an asking price and a taking price. They do incalculable harm to the equipment industries as a whole. Perhaps the true story told here will help them to reform before it is too late—and will warn others

Perhaps you think that these generalities are hard to prove but let me cite a particular case:

My company is by all odds one of the most liberal-minded outfits with which it has been my privilege to associate. While naturally wishing to purchase with fair economy, it is never prone to quibble at price in any case where equipment is required. As a result it is undoubtedly imposed upon in many cases by dealers who know this weakness and with whom it has formed trading relationships. In other words, a mere nominal difference in price has never been sufficient to sway its purchases to one concern or another.

A short time ago an emergency arose wherein it seemed highly desirable to procure a certain type of machine tool.

Accordingly the matter was taken up with one of the large companies handling this type of machine and in due course the writer, in company with our mechanical superintendent, was taken by a salesman to inspect a specimen of this company's product, which was doing good service in another of our local plants. Every opportunity for observation and inspection was offered and as a result of this visit the machine "sold" itself to the visitors as being just what they could use to good advantage on their work. When it came to the matter of price the salesman, with a great show of frankness, laid out for our inspection his price books, from which he built up a price of around $4,000, including therein as extras a number of essential items. As evidence of the proneness to co-operate which our company manifests in its dealings, let me merely say at this point that, steep as the price appeared by the time the various "extras" had been added, the inclination was even then to accept the proposition, especially in view of the fact that the salesman assured us that in quoting as he had he had given us the benefit of the very lowest price at which he could sell.

So for the time being the matter was dropped, with the understanding that a formal confirmation of the quotation would be mailed us at once and that a purchase order would be returned within a day or so.

It just so happened, however, that within twenty-four hours of our arrival at the above-mentioned mutually-agreeable point in our negotiations we were informed of

the existence of a practically new machine of similar construction which was available, completely equipped, at a price which promised to place it in our shop at an investment of around $3,000.

Even this apparent saving of around a thousand dollars was not in itself sufficient to induce our company to follow up the cheaper offer, as there is an inborn dislike in the organization for anything "second-hand," no matter how good it might be. The deal would in all probability have gone through along the original lines had it not been that when the formal quotation was delivered in writing the total involved, including the same old "extras," came to something over $4,800.

Considering the extra cost of placement and motorizing, it became apparent that the new outfit would stand us very close to $5,500, which was considered far enough above the cost of the used tool to justify at least a small measure of gambling upon the latter.

No other machines of this type being readily available in the market at the time, an order was entered for the used tool and the matter dropped.

At the end of about two weeks the salesman for the first machine called up to ascertain the status of the deal, and upon being informed of the loss of the business, proceeded to "blow up." In the course of his tirade it developed that the actual delivery price on the new machine, which we had inspected in the other plant, had been only $2,800 with *all* of the extras "thrown in" to secure the sale.

In other words, there had been a spread of some $1,200 between the "absolute bed-rock" price quoted by the salesman, and the delivered price of an identical piece of equipment, and about $2,000 between this minimum and the formal letter quotation. Our company secured a second-hand machine against its expressed desire to purchase new tools, while the salesman and his company lost a sale which at no stage represented any particular difficulties or resistance.

An Additional Joker

The additional joker in the situation developed when we learned that this manufacturer had on hand in his warehouse one of the identical machines desired, which, because of its size and special features, had become practically unsalable and something to be sacrificed if necessary.

It might also be said that it will be a long while before that company has even the proverbial "Chinaman's chance" of booking an equipment order from our concern.

Now, what's the answer?

I am not enough of a student of salesmanship to perceive the advantages of a system which permits and fosters a performance of this sort.

Maybe I'm wrong.

Maybe the average of people demanding a "trading" margin is sufficiently great to justify this sort of tactics.

Personally, however, I doubt it, for in any business where competition is as keen and time as valuable as is the case among most machine tool users, the natural inclination is to secure facts in the quickest possible manner and then to act upon the basis of those facts as promptly as circumstances will permit.

I can appreciate the fact that occasionally it may be practical to make a sale under stress of circumstances, or through deliberate misrepresentation of facts, at prices which are gloatingly spoken of in the sales department as "long," and I can also understand that the extra profits accruing from such sales can assist materially in bolstering up an average from the poor deals inevitable in any business; but what a blessing it would be to both the buyer and the seller if we all became "sold" on the idea of a fair one-price basis of doing business.

This, of course, does not apply to any commodity transaction which comes under the category of "quantity" discounts, for the prices derived under this system, if properly applied, are perfectly fair and justified by relative production efficiencies; but, whatever the commodity may be, the basic unit price should be the same to all men.

That we have in such an example as that cited no special case but rather an evidence of a general condition would be indicated by the case occurring only a short time ago when the representatives of a well-known concern came into the office and in all seriousness asked boldly to have us let them know if their bid on a certain contract job proved out of line, as they would wish to "shade it" materially.

I am not by nature one of those statistical "bugs" who love to figure out such marvels of concrete data as, for example, the effects of the flying machine on the planet Mars, but I do feel that an enormous amount of time and effort would be saved and a whale of a lot of sales resistance automatically wiped away, if every buyer could trust the seller to give prices promptly, definitely and in such form as to assure equality with other buyers.

Why Use Slotters in Railway Shops?
Discussion

By F. Rattek

NOTING M. H. Westbrook's article under the title given above, on page 697, Vol. 67, of the *American Machinist*, prompts me to give the result of many years experience on locomotive maintenance.

We know full well that not every master mechanic has the use of the special machine of the type referred to by Mr. Westbrook for driving-box work, the old slotter that grandpa juggled with is their best standby.

However, it is evident to any who have given much thought to the subject, that it is easier and quicker to lay a piece of work down than it is to hang it up; easier to lay a big driving box down on the slotter table than it would be to hang it up on a special machine; for by placing it on the edge the operator has two edges or faces to note.

Had we a modern slotter, thoroughly up to date, with high-speed automatic traverse, and rotary-table movements effected by the shifting of a small lever; a maximum diameter of tool head, of a ruggedness proportionate to the ram dimensions; steel driving boxes could be machined with heavier feed and in quicker time than on any special machine. This also applies to machining crown brasses and many other parts in locomotive maintenance.

The reason why, at the present time, the special machine referred to by Mr. Westbrook is in the lead, lies only in the superiority of the ram and the toolholder. As a champion friend of the slotter, I must admit that these parts of the draw-cut shaper are of admirable design, and I have long wondered why the manufacturers of slotters have never been clever enough to copy them.

Most any dumbbell can do the easy jobs—the difficult jobs are for the best mechanics.

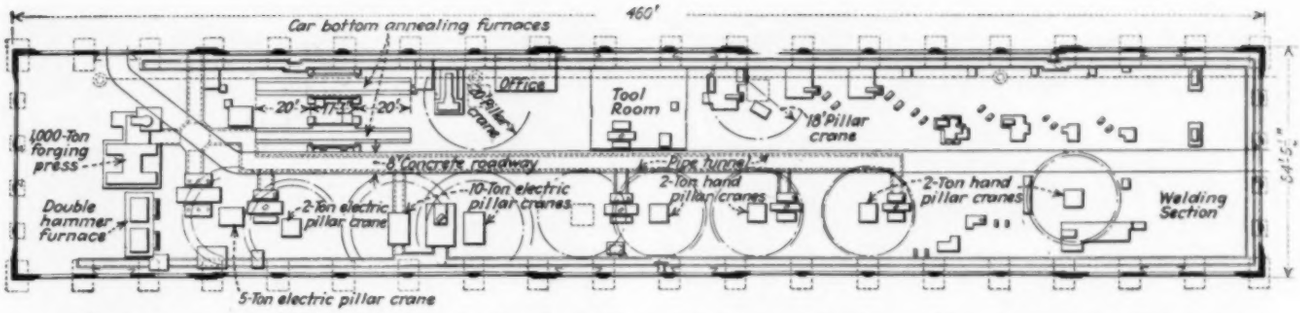


Fig. 1—Layout of the blacksmith shop showing the positions of the hammers, forging machines, furnaces and pillar cranes

Blacksmith Shop Layout at Paducah

By Frank W. Curtis

Western Editor, American Machinist

EQUIPPED with the facilities required for the general class of railway work, the blacksmith department of the Illinois Central System's shops at Paducah, Ky., is 86x460 ft. Among the equipment are seven steam hammers of the single- and double-arch type, ranging in capacity from 1,000- to 5,000-lb.; two smaller hammers, used exclusively for tool work; and seven forging machines for handling bolt and miscellaneous bar forgings. Individual furnaces of the oil-fired type are provided for the majority of these units, as indicated in the layout shown in Fig. 1. The larger furnaces have pyrometer control, the recording devices and master board being located in the office.

Connecting-rod forgings and work of the larger type are handled in the 1,000-ton hydraulic forging press shown in Fig. 2. At the right of the press are two large furnaces, each having two doors, used for heating and preheating work preparatory to forging. The four furnace doors are operated by air cylinders located at the rear and controlled by valves placed in a convenient location at the front.

All forgings are heat-treated before being sent to the machine shop for finishing. Larger parts are treated in the car-type furnaces illustrated in Fig. 3. Each furnace has two cars, one of which is being loaded while the other is in use. The furnaces have doors at both ends to enable the cars to be taken in or out at either end. All doors are opened and closed by air-operated cylinders. At the front of the furnaces is shown one of the work platforms utilized in transporting forged parts from the hammers or presses to the furnaces.

Many locomotive parts, chiefly motion work pins and

The fourth article of seven. The fifth will appear in an early issue.

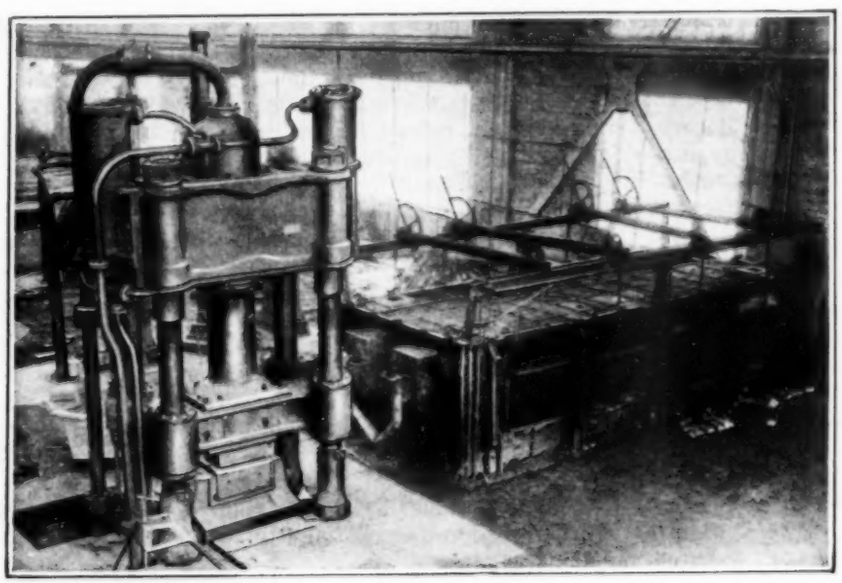


Fig. 2—Connecting rods and heavy units are forged in a 1,000-ton hydraulic press located at the north end of the shop, and served chiefly by an overhead traveling crane. Two heating furnaces at the right are utilized for heating material prior to forging. Each of them is equipped with two doors that are operated by air cylinders located at the rear. The controlling valves for the doors are conveniently positioned at the front of the furnaces

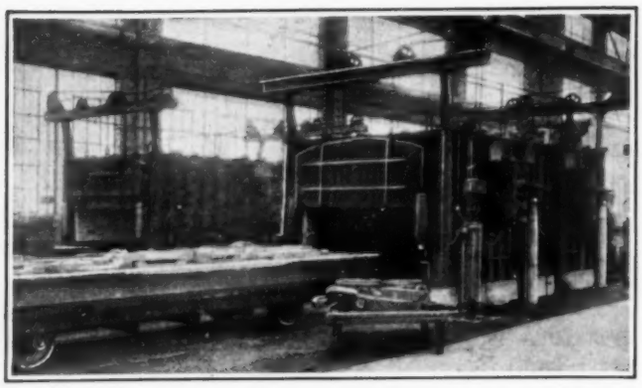


Fig. 3—Two car-type furnaces for annealing forged work before machining. Each furnace has two cars enabling one to be loaded while the other is in use. The furnaces have doors at both ends so that cars can be taken in or out at either end. Air-operated doors are used throughout. One of the work-carrying platforms for the transportation of parts from the hammers is shown in the foreground

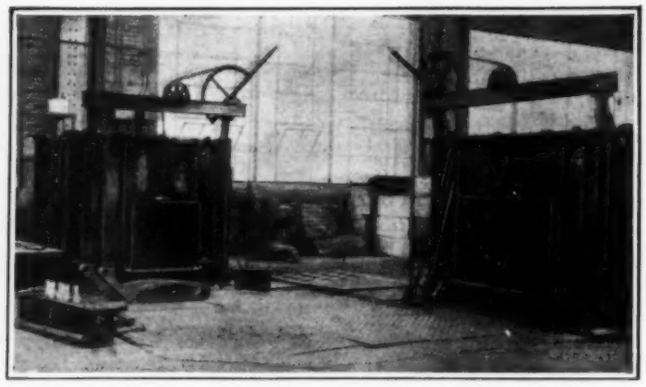


Fig. 4—Recent tests have shown that by heat-treating locomotive parts subjected to wear, it is possible to obtain longer life before replacement is required, therefore such units as motion parts, pins and bushings are casehardened after being machined. These two furnaces handle the majority of the work. They are placed at right angles with each other for convenience of operation

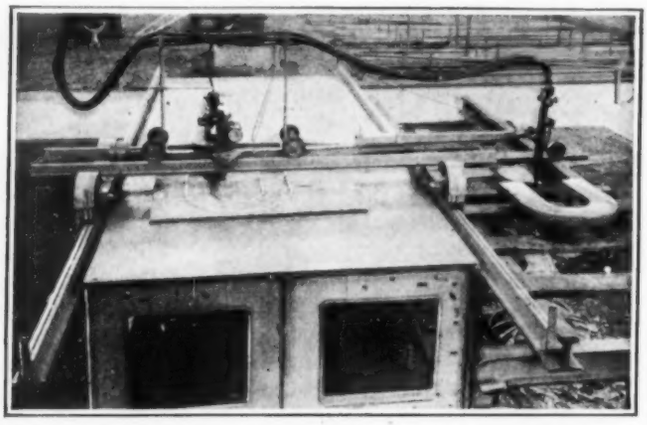


Fig. 5 — A shape-cutting machine, furnace and miscellaneous benches and racks are to be found in the welding department, located at the south end of the shop. Such parts as equalizers, rods, frame pedestals and motion parts are cut out by the machine, some of them being of flat material while other pieces are forged first and then trimmed to suit. All parts are annealed before being machined

bushings, are casehardened after machining so that they may render a longer life in service. The majority of such work is heat-treated in the furnaces illustrated in Fig. 4, arranged with their doors at right angles for convenience of operation.

At the south end of the shop, in the welding department, is a shape-cutting machine and an annealing furnace, as well as racks for patterns, and laying-out tables. The cutting machine is illustrated in Fig. 5. It is served by a jib crane to facilitate loading and unloading heavy materials. Among the parts cut out by the machine are equalizers, frame pedestals, small rods, motion parts and other miscellaneous work, some of which is made of flat stock while others are forged to the proper thickness and then cut out to shape. The machine is semi-automatic in operation, having as its main units a carriage that operates longitudinally on four rollers; a motor-driven tracing unit that also travels on four rollers, but at right angles to the carriage; and a cutting torch attached to one end of the tracing-unit frame. The patterns are made of $\frac{3}{8}$-in. square soft aluminum strips and are mounted by rivets to sheet-metal backing. Two driven followers of the tracing unit engage the upper edge of the aluminum strip, causing the upper frame and cutting torch to follow the form of the pattern. All parts are annealed before being machined.

New Instructions to Naval Inspectors

INSPECTION is not an easy task at the best. And when it must cover thousands of items in many fields of manufacture, as in the case of materials for the Navy, it becomes an exceedingly difficult problem to issue proper instructions without a tremendous burden of red tape. In the recent "Instructions to Inspectors of Naval Material" many modifications have been made to enable full advantage to be taken of the consolidation of the different material bureaus, last year. For each bureau formerly had its own instructions and administrative systems, which usually differed from all the others.

The present instructions cover all bureaus and consequently secure considerable simplification, both in the number of forms required and in the general reduction of clerical work. Although it is too early to know the extent of the saving, the present instructions seem much more businesslike and have reduced the amount of red tape very considerably. The present organization and administration is much more flexible and can be expanded or contracted to suit the volume of work to be handled.

Some of the advantages due to the consolidation of inspection are reduction in expense due to maintaining fewer offices, consolidating files and records, and more effective work from the personnel. Inspection is better because of more experts in each office, so that specialties can be taken care of more advantageously. Then, too, a manufacturer in any district deals with only one office and can therefore make better contacts with less confusion and misunderstanding.

Particularly noticeable is the section on reports of material shipped. These reports are designed to enable every piece of material to be definitely traced and identified with very little trouble. While no set of instructions can endow all inspectors with the wisdom of Solomon, and points of difference are bound to come up from time to time, it is gratifying to note an earnest effort to modernize and simplify the inspection practice of the Navy.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Extra Pay for Extra Effort

AL AND Ed were strolling home from the station. "I feel flattered today, Ed," said Al. "Williams asked how I would answer some bonus questions that another super had written him about. Here's a copy of the letter."

"I'm in a hurry tonight, Al. But give me a point or two to think about. We can take up the rest later."

"All right; I'll read one paragraph:

"Take, for example, a straight piece-rate system where a normal task is 40 units an hour. A man is able to produce 50 and as a result gets a corresponding increase in his wages. For this task a figure has been set after a careful analysis by a time-study man. Now on top of this, suppose that the operative finds a short cut in addition to that already provided by the time-study man, and by means of this suggestion the man through the same effort increases his output from 50 to 70 units an hour. Is it practicable not only to pay him the regular piece-rate increase of wages from 50 to 70, but on top of that, a bonus for his interest in the job and the suggestion made by him?"

"That's enough, Al. Let me think that over. See if I remember it—normal task 40 units; man produces 50 and gets paid accordingly; finds short cut and goes up to 70. Should he be paid piece rate for 70 and a bonus as well?"

"You may as well think over what Williams and I fixed up for reply, too. Then if you convince us we're wrong, we can change the letter. Here it is:

"Assuming that the rate set by the time-study department for the 40 units referred to permits a man to make a fair wage and that production of 50 pieces will give him something with which he is very well satisfied, I believe that no additional remuneration is necessary if by his own effort he increases his output to 70 units, *provided the piece rate is not cut due to the extraordinary production.*"

"I'll try to keep all that in mind, Al, and let you know tomorrow what I think. Good night."

"Good night, Ed."

Was Al correct, or should there have been a bonus over and above the allowance of piece rate for 70 pieces? Or should a bonus have been given and the rate cut? Or should no bonus have been given and the rate cut?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Is the Kicker Always a Nuisance?

I HAVE always leaned a little toward those called cranks and knockers. Whenever I have begun to think that things are O.K., someone has begun to kick about certain matters that I have overlooked. Then, I have had to revise my estimate of my faculties and abilities and get on my toes again. So, instead of considering a kicker a nuisance, I am always glad to at least listen to him. —ALLEN J. DAVIS.

ANYONE who gets into the habit of kicking just for the pleasure he seems to get out of it would be a nuisance. But Bert was justified in doing some constructive kicking. If Ed had not been negligent, Bert would not have had occasion to tell him the second time about the defect in the floor, which contained the possibilities of a serious accident. What really peeved Ed was the fact that his conscience told him Bert was in the right, and it jolted his complacent habit of postponement. —A. P. TOMLINSON.

Discovering Hidden Ability in the Men

MANY intelligent workmen, obviously enough, have through adversity fallen far below their standards in the shops. But the fact that their intrinsic qualities are not brought forward, invariably rests more on the individuals than on the management that they are serving. The majority of capable men in any profession will, in nearly every instance, be found at the top of the efficiency report, so that a careful check of this list should give sufficient evidence as to the abilities of the workmen.

The shop ratings should be adhered to when men are to be selected to fill responsible positions, since their true value is apparent. To put such power on the shoulders of the doubtful workman would be taking a gambler's chance on his abilities. —HARRY OTTERSEN.

Shall It Be Layoffs or Short Time?

AN INVESTIGATION to ascertain the views of the men on the approaching issue regarding either a layoff or part time for the entire force is obviously the best method of procedure, and should then be dealt with in accordance with the answer as determined. Such a move, regardless of its outcome, must inevitably benefit the manufacturer.

If the layoff is decided upon by the choice of the workmen, the fortunate group that will remain in service will feel as though their value is appreciated by the executives. It will also tend to eliminate that ever-present feeling of discrimination that certain individuals are being imposed upon due to executive prejudice. If the part time schedule is inaugurated, the entire shop personnel will render its utmost in production to show appreciation for the consideration extended by the officials. —PETER HAGEN.

THE·NEXT·TOPIC

Paying a Bonus to Outsiders

ADVANCE QUESTION

Should a man be given a bonus for improving the method of doing another man's job?

They Set Their Own Rates

PERMITTING the workmen to set their own basic rates for piecework would be a costly error. To satisfy both sides in wage setting I would suggest a wage board comprised of two shop executives, one of whom should preferably be the foreman, and two mechanics. By conferring on each unit of work that is under discussion, it is certain that a fair scale could be enacted that would be fair to both men and management. —E. N. PETERS.

Making Time Studies

I AGREE absolutely with C. L. Anderson, Methods Engineer, in his article on time study. It is not only exceedingly bad practice for a time-study man to work under cover, but it is actually foolish, and if the time-study man is instructed by his superior to take such time studies the superior is incompetent. The very first essential in making time studies is to become acquainted with the workers by observation and investigation. Often officials make the serious mistake of instructing time-study men to make studies before becoming acquainted with the workers, and when time-study men begin their work by approaching with stop watch in hand, they immediately create an antagonistic spirit in the shop.

Employing time-study men at low salaries as an economic practice is false economy. In order to be a successful time-study man the latter must possess personality, even temper, be a mixer, and above all be experienced in the line of work.

—PAUL LINDNER, *Industrial Engineer.*

Machinery Tests the Telephone

Photographs by courtesy of the Bell Telephone Laboratories

Continued on next page

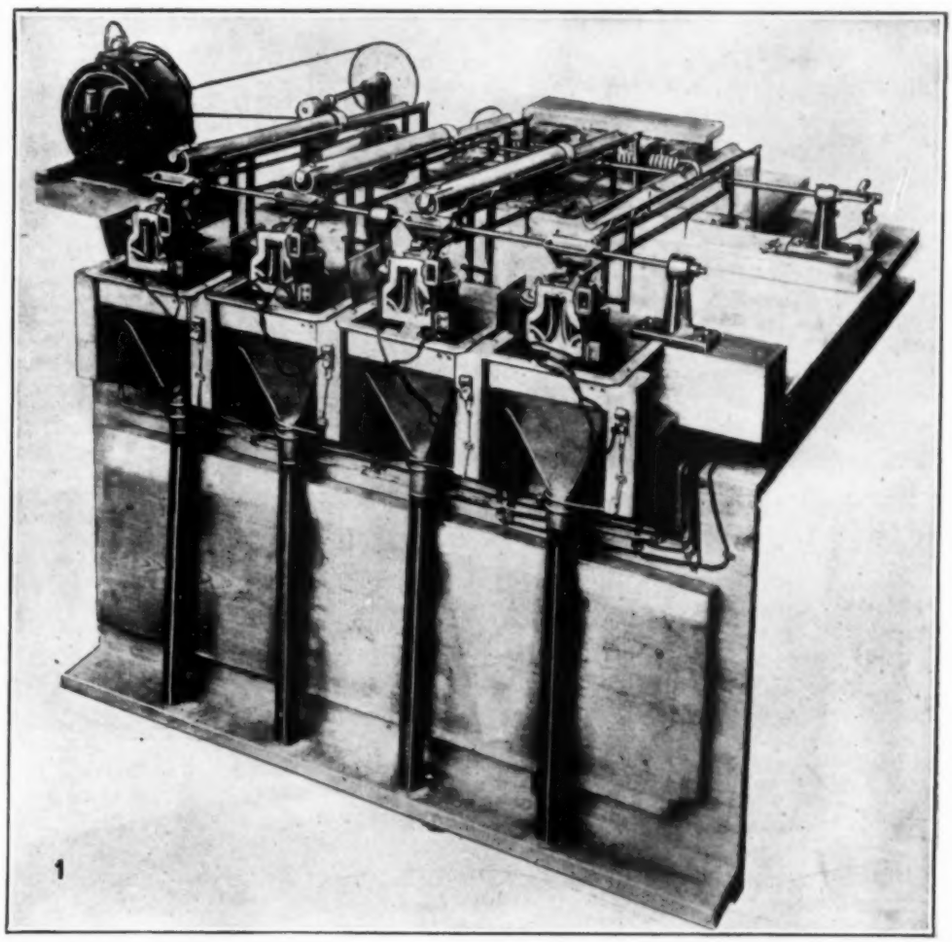
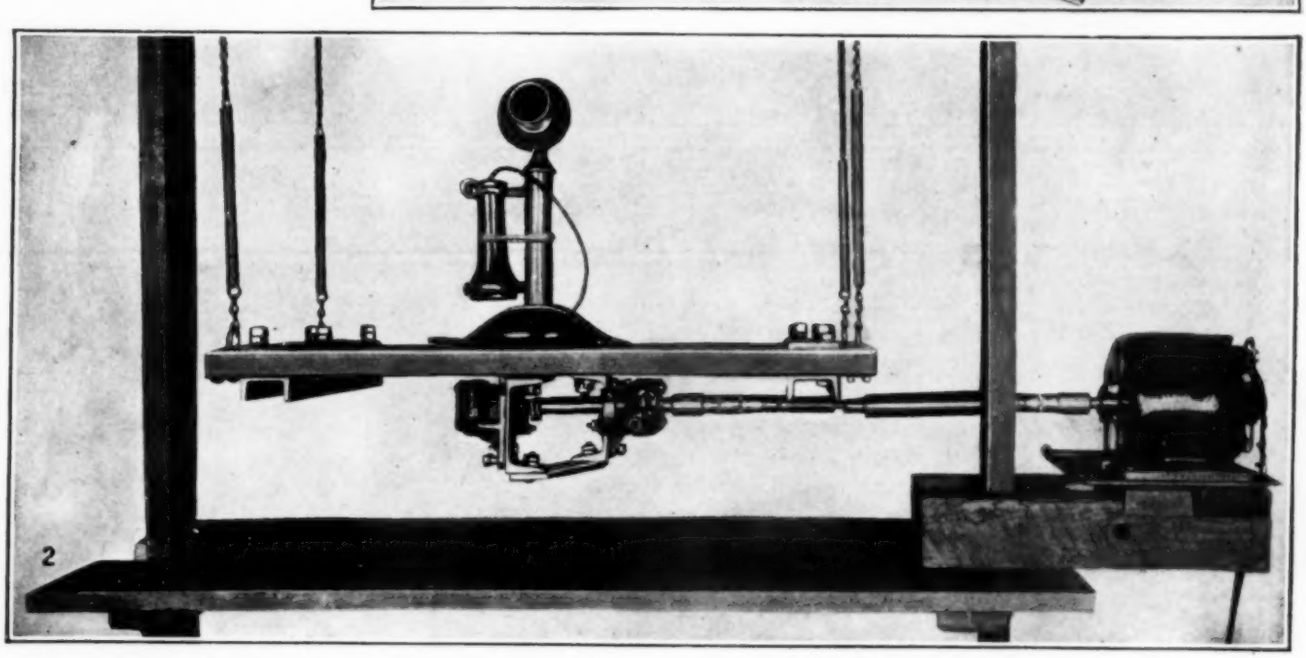


Fig. 1—Power driven machine for testing the life of coin boxes. Eleven nickels are dropped in succession, the box then emptied, and the cycle repeated. By locating the weak points in these tests the boxes have been redesigned for longer life

Fig. 2—Automatic equipment for testing the life of telephones under intense vibration. The motor shaft revolves at 1,800 r.p.m., and subjects the swinging platform to a continuous rocking and vibration



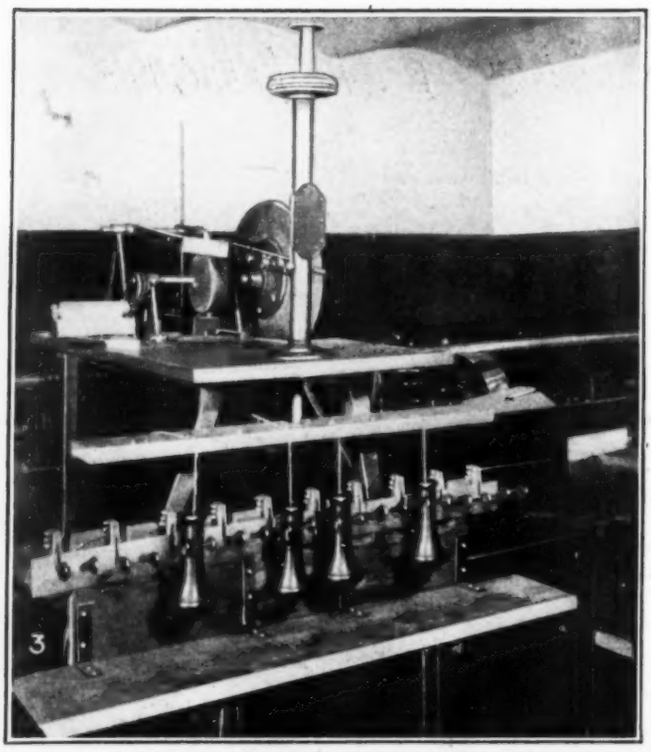
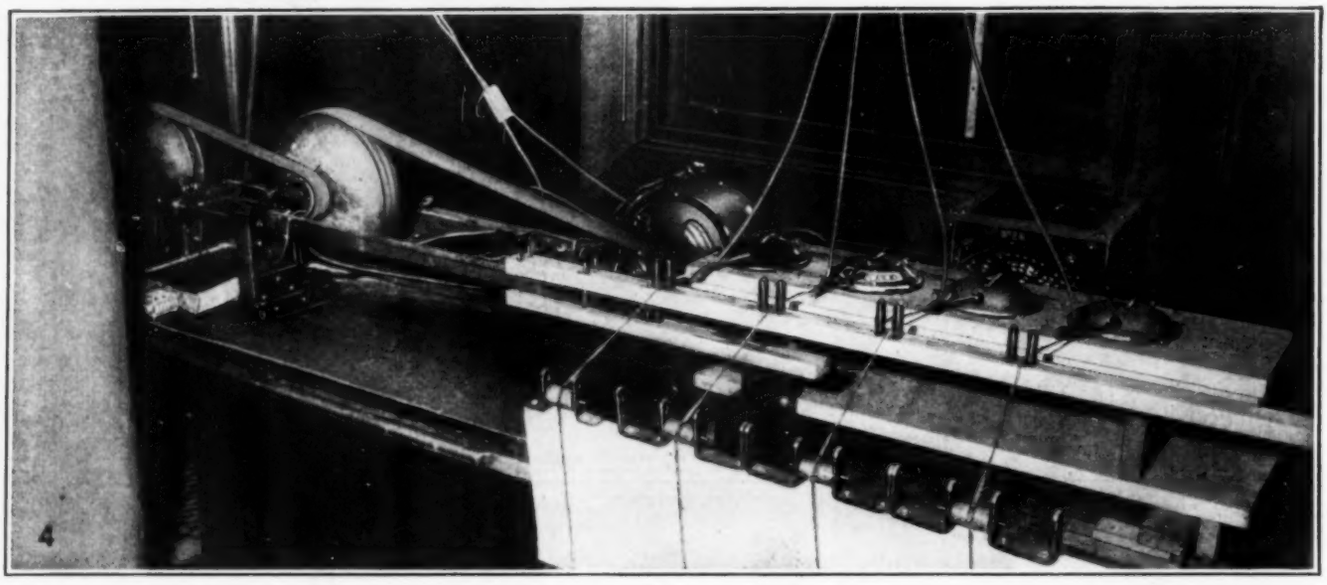
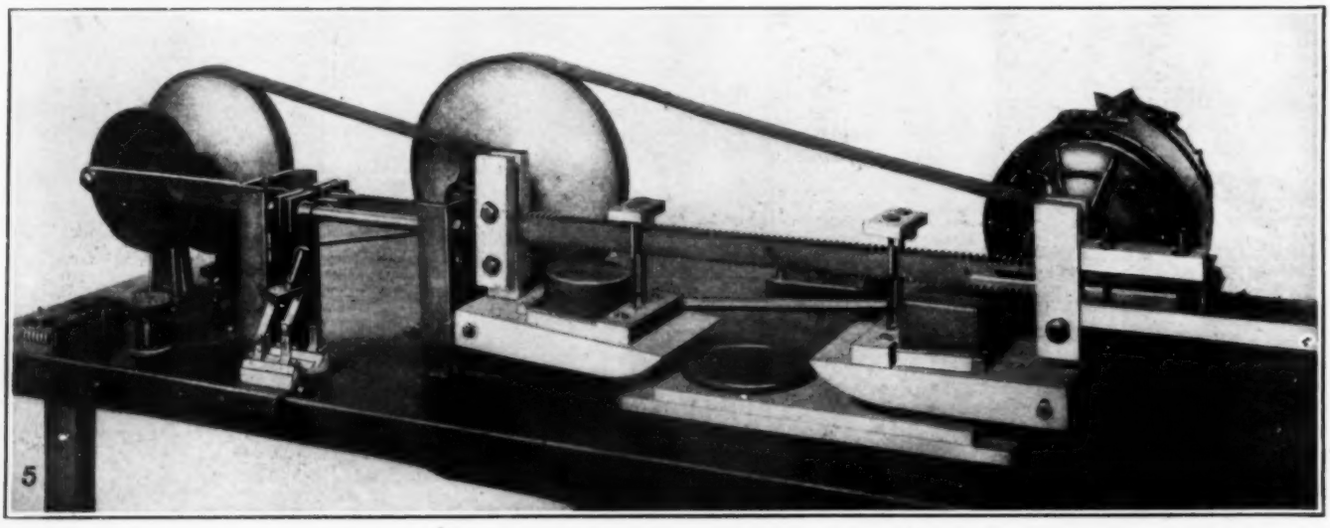


Fig. 3—Motor-driven apparatus for determining the effect of shock on telephone receivers. The receivers are dropped continuously into their hooks in a similar manner to their treatment in ordinary service. This gives a method of finding the weak points

Fig. 4—Automatic testing of the cords and bushings of desk telephones. The bushings were formerly of hard rubber, but the tests proved that less expensive punched-metal bushings were satisfactory

Fig. 5—Testing the felt base of desk telephones. The motor-driven blocks rub the base in a manner closely simulating the sliding action received in actual service





Optical Instrument Demands Unusual Precision

By Henry Simon
Jena, Germany

The scribing and checking of a half-inch line on a blade, used in a Zeiss measuring microscope, is described—An accuracy within plus or minus 0.00002 in. must be maintained

THROUGH the courtesy of Carl Zeiss, Jena, Germany, makers of optical and precision instruments, the writer was enabled to present this description of a high-precision dividing engine and the apparatus used to check its work. In the dividing-engine department of this company, which department is probably the most complete of its kind in the world, the entire apparatus was designed and built. It is now in use there.

It is typical of modern precision instruments that the mechanism of this dividing engine and the testing stand shown, are called upon to produce a single, fine, straight line, less than half an inch in length on a small accessory going into such an instrument. The production is only a few dozen pieces a day. Though in their larger outward features, neither machine exhibits an exceptional degree of perfection, all working parts, nevertheless, are examples of the very highest mechanical skill. This circumstance in itself, however, is of minor importance compared to the fact that the dividing engine allows a line one ten-thousandth of an inch wide to be drawn parallel to within plus or minus 0.00002 in. and that the testing apparatus, in order to prove the truth of these tolerances, permits readings to be made correct within limits of about 0.000008 in., plus or minus.

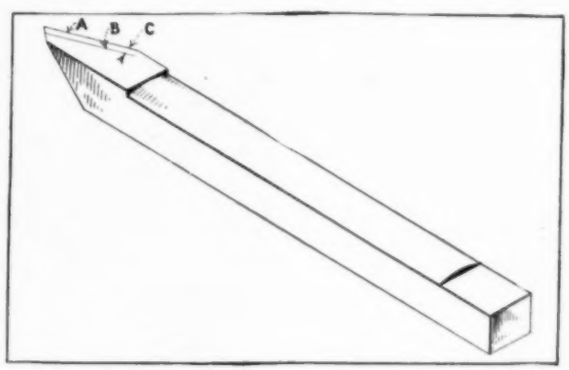


Fig. 1—The line scribed on this steel blade, used in a Zeiss universal measuring microscope, must be parallel within plus or minus 0.00002 inch

The equipment is used in the production of the small steel blade, shown in Fig. 1, which is an accessory employed in the measurement of screw threads with the Zeiss universal measuring microscope described on page 913, Vol. 66, of the *American Machinist*. A pair of these blades is used in measuring the threads: the edge *A* of each blade is moved into contact with the flank of the thread, and the parallel line *B*, drawn on the optically-finished tip, serves as the object of observation in establishing the angle, pitch and lead of the screw threads to extreme limits of precision. Since the distance *C* is a constant that adds and subtracts itself once in every measurement taken, it was necessary to establish the tolerances indicated above, which, in so far as line measurements are concerned, represent the absolute extreme of precision in measurement on a commercial article.

To draw such a line to these limits and under the conditions presented by the character of the blade, was a job that taxed even the experience of the Zeiss Works, where measurements of a millionth of an inch are routine everyday occurrences. The natural thought would be to draw the line first and then to grind and lap the edge true and parallel, as the correction of errors could be made in this way. This plan was, in fact, tried, but proved impracticable, as by no agency did it seem possible to prevent removing too much metal here and there in the majority of blades so handled. It was decided, therefore, to try the plan of producing the line after the knife-edge was finished, and this is the way it is now done. First, however the question had to be solved of how to place the blade so that the knife-edge would be parallel to the path of the line-drawing point within a quantity reckoned in millionths of an inch. The answer was that part of the mechanism shown in Figs. 2 and 3. Flush with the front face and upper edge of a rigid bridge *A* on the main transverse slide of the dividing engine, there is a quartz block *B* with a front surface which is an exact plane. This vertical surface of the block coincides with the pivotal axis *C* of the rocker *D* which carries a slide *E* bearing a holder *H* in which the blade to be scribed is clamped. A rod *K* attached to the rear end of the rocker *D* carries an adjustable counterweight *L* to free the rocker bearing from any strain except the axial thrust, while a fine coil spring *M*, above and parallel to the rod *K* and attached to a collar on it, pulls the slide in a direction exactly at a right angle to the registering surface of the quartz block *B*. The whole arrangement is an exceedingly sensitive mechanism, and a slight lateral pressure is sufficient to swing the slide out of alignment.

In the idle position, the blade-holder *H* is in contact with the front face of the bridge *A* under the pull of the spring. In operation, the slide is pulled back and the blade clamped in one or the other of two positions of the holder, depending on whether the blade is right- or left-handed. When the slide is released, the edge of the blade is pushed with a definite pressure against the face of the quartz block. At the same time, any existing slight misalignment of the blade edge and contact surface

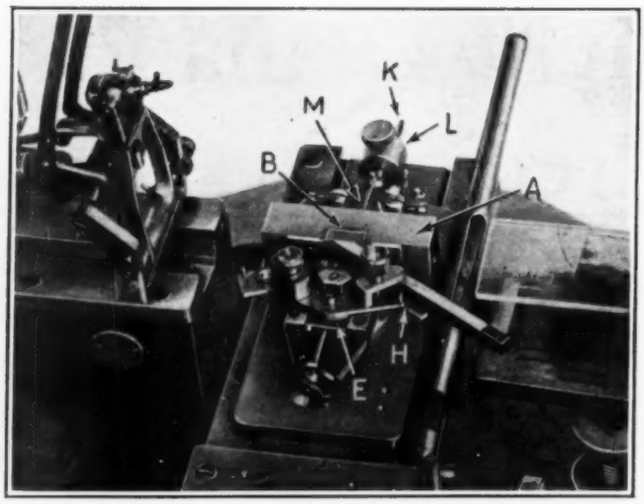


Fig. 2—In the mechanism for accurately positioning the blade for scribing, the balancing action is so sensitive that possible variations along the line of contact cannot exceed a few millionths of an inch

is automatically taken up by the compensating action of the rocker on its axis. As stated before this axis coincides with the surfaces in contact, and nearly with a point halfway along the blade edge. So delicate is this balancing action that possible variations along the line of contact cannot be over a few millionths of an inch.

The line is now drawn by the dividing mechanism, which in itself is highly interesting in its design. It is shown in Fig. 4. A diamond point *N* is cemented to the nose of the universal head *O*, which can be rotated and locked at any point of a complete circle. In addition it can be inclined and locked at any desired angle, both axially and transversely, in order to permit the ideal positioning of the diamond point with reference to its cleavage so as to get the ideal cutting action. This diamond head is mounted on a frame *P* pivoted at its lower end on centers in another frame *Q*, which in turn is attached to the working slide of the dividing mechanism. The weight of the head and frame is carried by the long angular rod *S*, the front end of which rides on a glass plate mounted on Table *T*, while the rear can be firmly clamped in any position to the ear of the diamond head.

It will thus be seen that the diamond can be separately

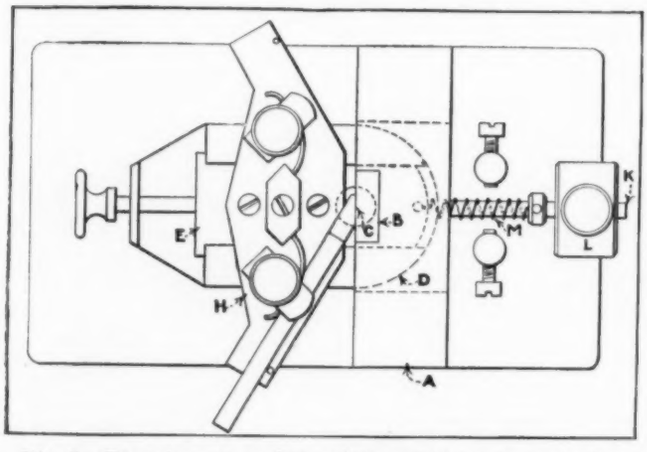


Fig. 3—The plan view of the blade-positioning mechanism shows the blade, mounted in holder H, pressed against the quartz block B through the medium of spring M. The entire holder and carriage is pivoted about the axis C in the plane of the front face of the quartz block

rotated, inclined in any direction, and lowered or raised, so that it is possible, by this combination, to adjust the position of the actual cutting point with the utmost nicety. It still remains, however, to provide for a definite standard pressure on the point in order to render the width of the line independent of slight fluctuations in the height of the blade surface relative to the diamond. This condition is satisfied by a balancing lever arrangement that consists of the odd-shaped arm *V*, extending over and around rod *S*, to which it is connected in front by means of a silk thread. It is pivoted on centers at the upper end of the outer frame *Q*, and counterbalanced by weight *W*, adjustable on a graduated bar that engages arm *V* at its hub. The entire arrangement can be swung back and out of the way, whenever desired, in order to have a free space around the work location when making adjustments.

It may be interesting to note that the weight required to produce the 0.0001-in. scratch in the hardened steel is approximately 20 grams, or 0.7 oz., and this weight is variable within extremely fine limits by means of the balancing arrangement described. It is also worthy of note that a fluctuation of 1 deg. in temperature is in excess of that allowable while working. Though the temperature of the entire dividing room is kept within narow limits, a special thermometer *X*, Fig. 4, is used to make sure

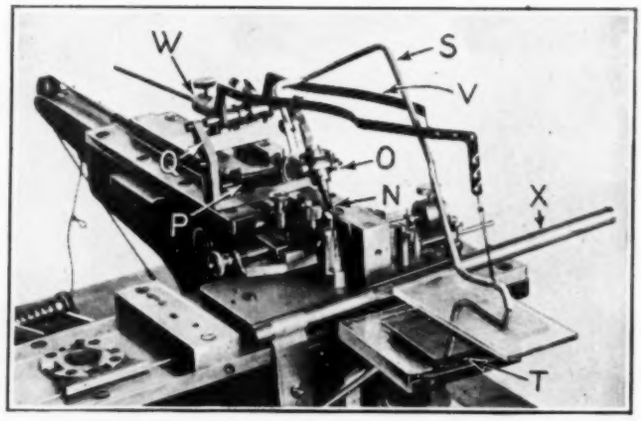


Fig. 4—The scribing mechanism is in place. The diamond-holder O can be adjusted to obtain the best cutting action. It is mounted in a carriage and drawn across the work by means of a cord. The levers S and V, are part of the mechanism whose function is to regulate the cutting pressure of the diamond

that local disturbances (caused by the heat of the operator's body, for instance) will not adversely affect the work of the dividing engine.

In the idle position, the diamond remains raised slightly above the surface of the part to be graduated. To operate, table *T* is let down, thereby causing rod *S* to drop and the diamond to come to rest on the part being scribed. The point is then drawn across the work by pulling a string running over rollers and attached to the slide upon which the dividing mechanism is mounted.

The difficulties of this job did not, however, end with the scribing of the line. It yet remained to check the result. Here again an unusual problem was presented by the nature of the blade. The elaborate single-purpose testing device shown in Fig. 5, had to be devised before it was possible to check the half-inch line with a degree of precision sufficient to satisfy the exacting demands of the job.

This instrument consists of a heavy iron base *A* in

which a measuring microscope *B* is rigidly fixed in position. Opposite the end of the microscope, also immovable, there is a cicular table *C*. The upper, optically-finished surface of the table carries the blade-holding device, which consists of a slide horizontally movable in ways placed at a right angle to the top of the table A quartz block *D* is positioned on the table and in front of the microscope in such a manner that the edge of the blade, when clamped, will come to rest on the upper surface of the block. When the blade is in position, the line, if properly drawn, will appear in the ocular centered between two close, parallel lines.

Considerable thought was required to find a way to so place the blade and clamp it as to bring the angular edge

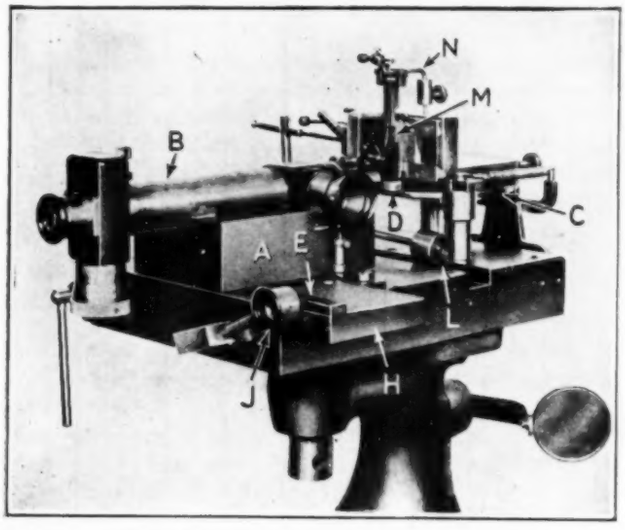


Fig. 5—The position of the scribed line is checked in this apparatus. If properly drawn, the line appears centered between two parallel lines in the ocular of the microscope

automatically into a perfectly even contact with the surface of the size block. Where an article must be gaged in terms of hundred thousandths of an inch, the total permissible errors in the arrangement of the various parts of the testing device cannot exceed more than a few millionths, and an extremely slight displacement of the angular edge of the blade would therefore cause trouble. The method used to meet this condition is as ingenious as it is simple.

A plane block *E*, Figs. 5 and 6, is cemented to a projection *H* in front of the base of the testing stand, and a strong magnifying glass *J* is mounted in front. The blade is placed in a special balancing holder *K* and is set up with its edge on the size block. By means of an adjustable counterweight *L*, it is possible to balance the holder and blade on the contact edge by gravity alone. On being viewed through the magnifying glass, the slightest crack along the line of contact between the blade edge and the block surface is immediately conspicuous as an intense source of light. When it is remembered that even under ordinary conditions a crack of a ten-thousandth of an inch or less is very clearly seen by the unaided eye, it will be clear that, under the special conditions provided in this case the most minute differences are readily detected. It is therefore easy, by slightly changing the setting of the blade in the holder, or moving the balancing weight by means of the thumbnut, to get the edge to make an even contact over the block.

With the blade so adjusted, the blade and holder are

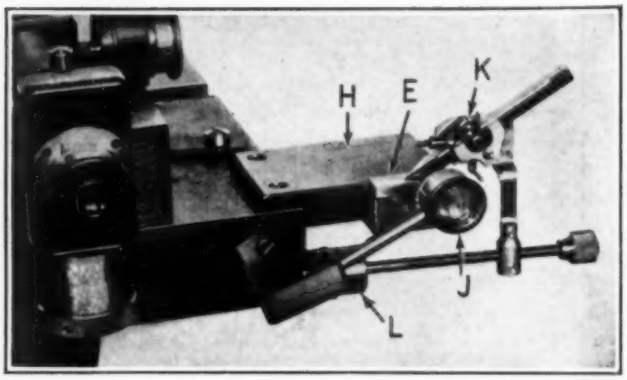


Fig. 6—The blade is adjusted in the holder, for use in the checking apparatus shown in Fig. 5, by sighting, through a magnifying glass, the light crack at the line of contact with the plane block E. The blade and holder rest by gravity on the block, being balanced by the counterweight L shown

transferred to the examining location, where they are allowed to assume, by gravity, their natural position on the quartz block *D* in front of the microscope. A wire hook *M*, movable up and down by a bell-crank *N* and engaging in a small grooved head on the blade holder, permits the blade and holder to be lowered to its position on the size block without shock or disturbance. The blade is clamped by a thumbnut and examined.

Chart for the Layout of Gearing

By C. Oldreive Thomas
Montreal, Quebec

THE accompanying chart is for use in the determination of face widths to satisfy any ordinary case of gearing.

Let W' = safe working load at the pitch line
A = face width
DP = diametral pitch
f = safe working stress
y = Lewis form factor.

By substituting $\frac{\pi}{DP}$, for the circular pitch p, the Lewis formula $W' = \frac{A\pi fy}{DP}$, and transposing, we obtain the relation $\frac{W'}{f} = \frac{A\pi y}{DP}$. In the chart, the value of $\frac{A\pi y}{DP}$ is called Q, and is plotted vertically against a range of face widths for each pitch. The proportions have been selected in accordance with present-day practice. There are two "curves," each consisting of a series of sloping steps; one is for a pinion of 15 teeth, the other for a gear having 50 teeth. The working load for any gear or pinion having these numbers of teeth is equal to the value of Q multiplied by the allowable stress for the material and the pitch-line velocity. In other words, Q is the load at the pitch lines that the gears will carry with a stress of 1 lb. per sq.in. as obtained by the Lewis formula.

A single example will be used to explain the chart: Let a set of gears consisting of a cast-steel pinion and cast-iron gear be required to transmit a peak load of

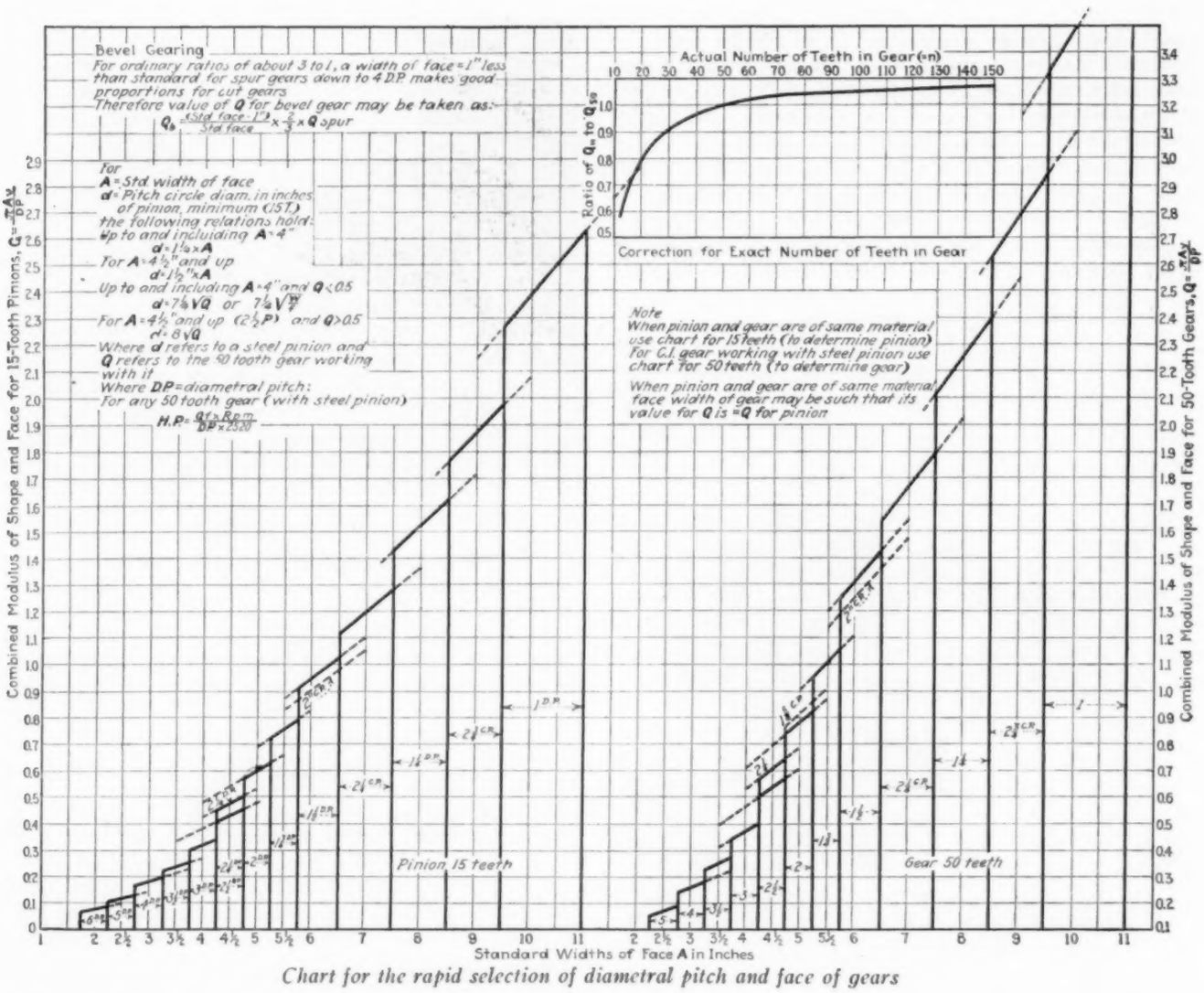

Bevel Gearing
For ordinary ratios of about 3 to 1, a width of face = 1" less than standard for spur gears down to 4 D.P. makes good proportions for cut gears
Therefore value of Q for bevel gear may be taken as:
Q bevel = Std face − 1" / Std face × 2/3 × Q spur
for
A = Std width of face
d = Pitch circle diam. in inches of pinion, minimum (15T)
the following relations hold:
Up to and including A = 4"
d = 1 1/8 × A
For A = 4 1/2" and up
d = 1 1/2" × A
Up to and including A = 4" and Q < 0.5
d = 7/8 √Q or 7/8 √(2 1/2 P)
For A = 4 1/2" and up (2 1/2 P) and Q > 0.5
d = 8 √Q
Where d refers to a steel pinion and Q refers to the 50 tooth gear working with it
Where DP = diametral pitch:
For any 50 tooth gear (with steel pinion)
H.P. = Qf × Rp m / DP × 2520
Actual Number of Teeth in Gear (=n)
Ratio of Q_n to Q_50
Correction for Exact Number of Teeth in Gear
Note
When pinion and gear are of same material use chart for 15 teeth (to determine pinion)
For C.I. gear working with steel pinion use chart for 50 teeth (to determine gear)
When pinion and gear are of same material face width of gear may be such that its value for Q is = Q for pinion
Combined Modulus of Shape and Face for 15-Tooth Pinions, Q = 7/8 A/d
Combined Modulus of Shape and Face for 50-Tooth Gears, Q = 7/8 A/d
Pinion 15 teeth
Gear 50 teeth
Standard Widths of Face A in Inches

Chart for the rapid selection of diametral pitch and face of gears

50 hp. at 450 r.p.m. of the pinion with a 4½-to-1 reduction ratio.

Assume a pinion 7 in. in diameter, giving a pitch-line velocity of 825 ft. per min. At this speed, the safe working stress for cast iron would be about 3,100 lb. per sq.in. and the load at the pitch circle would be 2,000 lb. In this case, the gear will determine the pitch and face width. The relation must be such that

$$Q = \frac{W}{f} = \frac{2000}{3000} = 0.65$$

The point 0.65 is found on the chart at the right hand side for a 50-tooth gear, and is followed horizontally to the left until it meets the first sloping line of the panel for 2½-DP gears. It will be seen that either a 2¼-DP gear with a 4¼-in. face, or a 2½-DP gear with a 4½-in. face will approximately meet the condition. Selecting 2½ DP and 17 teeth, we would obtain a pinion diameter of 6.8 in., and with the ratio of 4½ to 1, the gear would have 76 teeth. The actual value of Q for 2½ *DP* with a 4½-in. face, is 0.63 for 50 teeth, or $0.63 \times 1.04 = 0.65$, or 76 teeth. The correction factor 1.04 is obtained from the curve at the top of the chart.

In the event that both the gear and pinion were made of cast steel a safe guess for the pinion diameter would be 6 in. At 450 r.p.m., the pitch-line speed would be 785 ft. per min. The corresponding load on the teeth would be 2,100 lb., while the safe stress would be about 6,500 lb. per sq.in. The required value of Q (determined in this case by the pinion), is, therefore, equal to $\frac{W}{f} = \frac{2100}{6500} = 0.324$. Following this figure horizontally from the left-hand column of Q values, we find that the first panel is entered for a gear of 3 DP with 4-in. face. This solution just satisfies the conditions if the pinion has 15 teeth. As the diameter assumed for the pinion was 6 in., however, it follows that it may have 18 teeth, and be about 10 per cent stronger, without changing the velocity and pitch-line load originally estimated.

It will be seen at once that by producing the sloping line of the 3-DP panel upwards until it intersects the center line of the next panel to the right, the value of Q can be read for a 3-DP gear with 4½-in. face. In the same way, Q may be quickly found for pitches and face widths not exactly on the stepped curve, so that two or three combinations of pitch and face, giving equal values of Q, can be easily obtained.

Bevel gearing may be approximately determined by the same method as the foregoing, with the exception that face widths are best assumed for each pitch as 1 in. less than standard. The value of Q is then read off for the narrower face widths by producing the sloping lines downwards, and taking about 70 per cent of Q, so found, as its value for the bevel gear. Values of Q for the smaller face widths of bevel gears can also be found by proportion from the standard widths.

Details of Jigs and Fixtures

Theory of Clamps

By J. A. Potter

Clamps are essentially for holding down parts on which work is to be done, but to function effectively a clamp must be designed and applied according to definite principles

THE main idea in clamping a part in a jig or fixture is that the part will be held in place and can be readily loaded and unloaded, but an important consideration in clamping is to clamp in such a manner that the work will not spring from the clamping action, and that the work will not move when the several operations are performed in the jig or fixture.

It is just as essential to clamp properly as it is to locate a bushing accurately, for a bushing out of place in a jig will show up in the hole at inspection, whereas a spring in the part, clamp, or wall of the jig cannot be so readily detected. Furthermore, if through error, a jig or fixture should be delivered to a manufacturing department with a boring defect, the error is likely to be caught with the first part produced, but a part that has been sprung in a fixture may not show the defect through the gaging systems adopted, and a number of succeeding operations may be made, resulting in the scrap of an entire lot of parts.

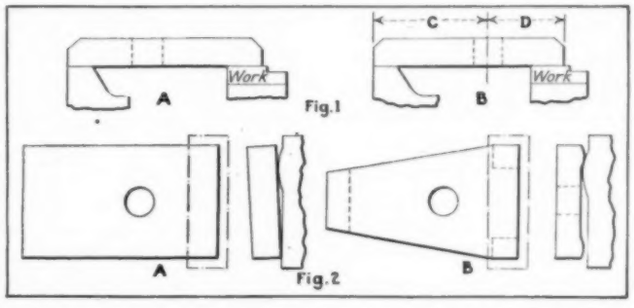


Fig. 1—Correct and incorrect positions of binding screw to obtain proper binding of a clamp. Fig. 2—Effect of seating a wide clamp on a rough casting, and the proper method of point contact for wide clamps

The theory of clamping can best be brought out by the illustration of a few common errors in the use of clamps. By showing the cause and effect on the part, and an application that will overcome the difficulty, it is hoped that the reader will be able to locate trouble in tools which have already been made, and apply the proper remedy, at the same time avoiding possible difficulty.

At *A*, Fig. 1, a clamp is shown with the leverage on the wrong side. This is a common fault, and often found in old tools. When a clamp similar to this is tightened, the tail end of the clamp will bear down on the body of the fixture, where it is not needed, while the part itself will not be held down firmly. There is, of course, sometimes need for a clamp of this kind in a lathe fixture which is to carry a large part where there is little room to swing, or on a large fixture with little clearances from the face of the machine. But it is not justifiable on a jig to keep the legs short, or to clamp on soft metal where there is danger of an impression, as other methods are available for these conditions. A clamp should be made as shown at *B*, Fig. 1, with the distance *C* greater than *D*, thus making the nose end of the clamp hold the work more securely. A good ratio to use is one and one half to one.

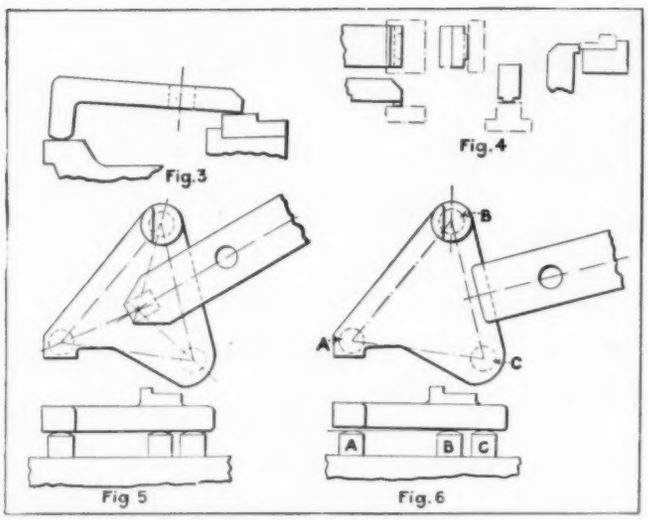
The nose of a clamp has considerable influence in the proper seating of a part. A clamp with a broad nose should not be used on a rough casting, for the nose will rest on the high spot only, or will tip as illustrated at *A*, Fig. 2. It is better to use a clamp, relieved on the end to rest at two points, the tail end of the clamp resting on one point as shown at *B*. This is called a three-point or floating clamp. The noses of some clamps are scored or cross checked to keep the work from slipping, but it is not well to place too much dependence on this. It is better to locate the work more securely. Where work is japanned or nickeled, a broad nose should be used so that the surface will not be marred. Parts that are of soft metal, and those that are finished, should also be clamped in such a manner that the nose of the clamp will not make an indentation on the surface. This marring of the work sometimes happens by having the tail of the clamp too high, as illustrated in Fig. 3, or by having the area of the nose too small as the clamp shown in Fig. 4, which will form an indentation on the softer metals.

A clamp that is too thin in its cross section will spring, and the operator will keep on turning the binding screw after the clamp is down. The same fault will also be found in a clamp that is too long, and the operator is always at a loss to know when the work is properly seated. A clamp that is narrow in width with a large hole for the binding screw is likely to bend if it is not strengthened by increasing the thickness. A good proportion to use is to make the clamp three times as wide as the hole is in diameter.

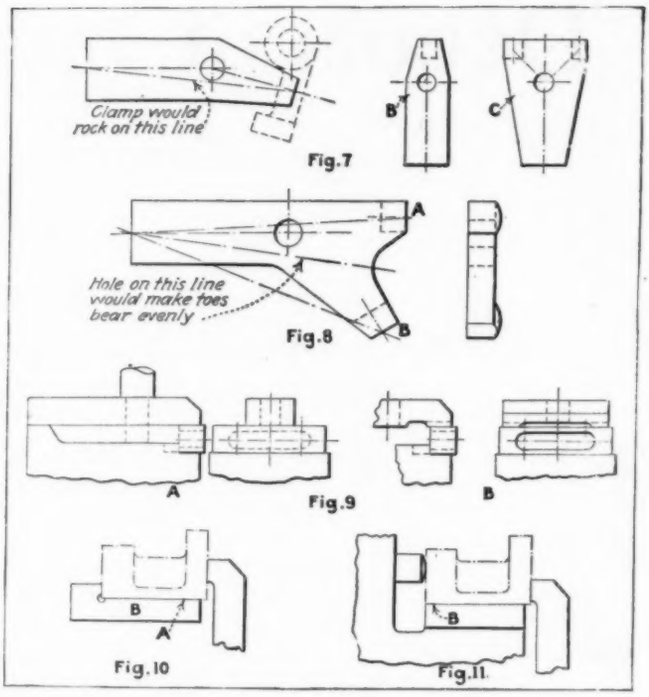
Springing that is not as easily detected may also occur in the walls of a jig, because of the weak section that gives under the clamping strain. This affects the holding-down power of the clamp, and sometimes also the action will spring the part. In designing clamps that swing on a shoulder screw, care should be taken that there is no tipping action of the screw. It is sometimes necessary to make the locating block and clamp self-contained to overcome the spring of weak walls.

To keep a part from springing in the fixture, much

The eleventh article of the series. The twelfth will appear in an early issue.



Figs. 3-4—Bad clamping practices such as a tilted clamp, or one with a nose area too small, will mar the work. Fig. 5—The point of contact of a clamp must be geometrically correct to hold down the work. Fig. 6—A clamp bearing on the slide and tilting the part



Figs. 7-8—Clamp screws must be positioned in relation to applied forces. Fig. 9—Wrong and right methods of clamping for internal cuts. Figs. 10-11—Clamping applications that cause tilting of the work

depends upon the proper location of the bearing seats, or stops, in relation to the point where the nose of the clamp is applied. This is illustrated in Fig. 5. In this case, the part is located on stop ends, and the nose of the clamp bears at a point in the center of a triangle formed by the stops. This, of course, assumes that the part is of considerable thickness, and will not spring in the center. If the part were thin, it would be necessary to use either two or three clamps, having their clamping action directly over the stops. If the part were machined on the under surface, a plate could be used as a seat instead of a stop. The use of a clamp, as shown in Fig. 6, will cause pivoting of the part on the stops *B* and *C*, and will lift it off the stop *A*. The use of another clamp directly over *A* would cause the part to spring.

An erroneous method in clamp design is illustrated in Fig. 7. The hole placed on the center line of the clamp is off center with respect to the nose and the back support. The effect of tightening the screw is to rock the clamp and bend the binding screw instead of clamping the work. The hole should be located on a center line running from the center of the clamping point to the center of the heel of the clamp. At *B* and *C* are shown the principles involved. In the case of the three-point clamp, as shown in Fig. 8, where the hole is off center with respect to the two clamping points, the clamp will hold down the work more firmly at *A* than at *B*. This is sometimes done intentionally, in order to bite more heavily at a position where the operation is to be performed. In Fig. 9, at *A*, is shown a part with a single-nose clamp that holds it sufficiently before the cut is made, but when the cut shown in dotted line, is made the clamp is likely to fail, due to the closing in of the walls. The proper method in a case of this kind is to use a two-point clamp, as shown at *B*, the bearing point resting over the part at positions where the metal is solid. Another cause of failure is to use a clamping point which is too high or too low in relation to the side or end stops. In Figs. 10 and 11 both cases are illustrated. In both cases the work will pivot, and not rest squarely in the jig. The best results are obtained by constructing so that the force of the clamp will act directly against the stop regardless of its relation to the seat. The most simple and direct clamp will ordinarily produce the best results. Moreover, it is usually better to use only one clamp, if possible, since the cost of handling time of the part increases with the addition of clamps. A good clamp should have the following features: It should hold the work securely and without springing; it should hold the work without marring or making indentations; it should be strong enough to spring; it should bear on the right point on the work, and should not rock; it should operate conveniently, and should be readily removable for cleaning; it should be in a position to keep clear of chips; and it should be hardened. Bearing these points in mind, the designer should have no difficulty with simple clamps.

Watch your FINISH

WHAT kind of finish products carry now has an important bearing on sales. The finish used and its method of application affect the producer's cost.

"Crackle" finish, described in this issue, is one of the *American Machinist* "finishing" series.

Other articles on finishing published this year told of enameling by production methods and the application of chromium plating for appearance and wear.

Coming articles deal with modern methods of painting machine tools, color in the machine shop, finishing camera parts, chromium plating automatically.

Relation of Shaper Stroke to Power Consumed

By Donald L. Perkins

Assistant Professor of Shop Practice, University of Michigan

VARIATIONS in the power consumed in removing definite amounts of metal at an approximately constant cutting speed for different lengths of stroke, should be of interest to shaper users. The determination of this power consumption was another of the problems undertaken in the writer's investigation in "The Art of Cutting Metals," made at the suggestion of F. L. Eberhardt of Gould & Eberhardt.

The Problem: *To determine the power required to remove definite amounts of metal at an approximately constant cutting speed for four stated lengths of stroke.*

The lengths of strokes used were 4, 8, 12, and 18 in. The cutting speed approximated 26 ft. per min. so that the following strokes per minute were used:

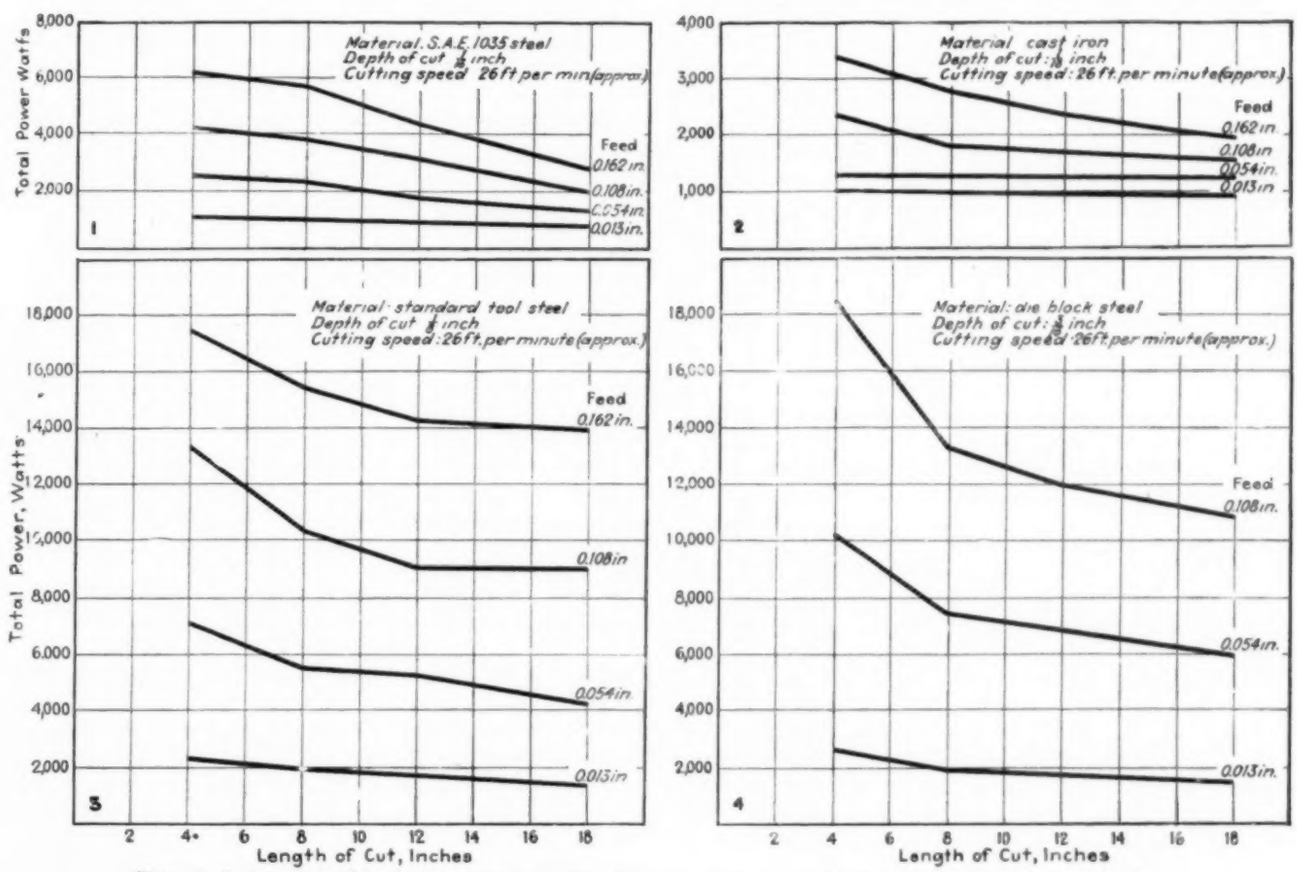
Length of Stroke	Strokes per Minute
4 in.	40
8 in.	19
12 in.	13
18 in.	9

The feeds selected were in the ratio of 1:4:8:12 and were approximately 0.013, 0.054, 0.108, and 0.162 inches. Three depths of cut were used: $\frac{1}{16}$, $\frac{1}{8}$, and $\frac{3}{16}$ inches.

The material cut consisted of bars of cast iron, standard tool steel, S.A.E. 1035 steel, and Heppenstall die-block steel. The material was secured in a vise with the jaws parallel to the movement of the ram. The material was held from being pushed out of the vise by placing under the material a steel bar $\frac{1}{2}$x3 in. in section by 14 in. long in which had been drilled properly spaced holes. In the proper holes were placed two $\frac{1}{4}$-in. bolts. One of these bolts was placed through the steel bar and kept it from moving along the vise: the other bolt held the end of the material from being shoved along the steel bar.

The materials used for each group of experiments were identical. The bars were gradually cut from 18 in. in length to 4 in. in length, so that all cuts in a given material were taken from the same bar and in the same direction on the bar. The writer believes this greatly increases the value of the data obtained.

A suitable cutting tool was selected for each material.



Figs. 1, 2, 3 and 4—Maximum power consumption on a shaper with strokes of 4, 8, 12 and 18 in. for various materials under cut

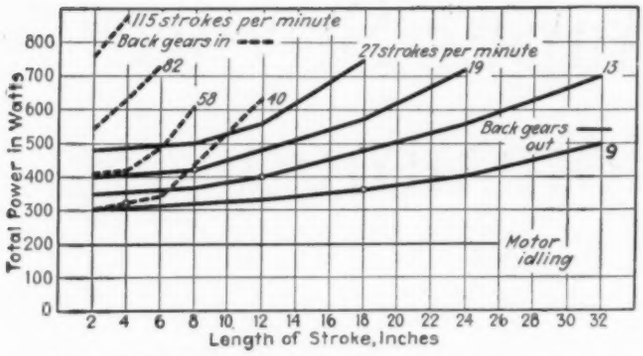


Fig. 5—Relation of the total power consumed to length of stroke with shaper idling

The tool was kept properly ground so that all cuts taken, whether for a 4, 8, 12, or 18 in. length of stroke, are identical as far as tool shape and tool condition are concerned.

The data obtained were plotted to show the power consumption in relation to the length of stroke. A few typical figures are illustrated. The figures show the maximum power consumption in watts for the four stated lengths of stroke and at an approximate cutting speed of 26 ft. per minute, as follows:

Fig. 1—Cuts $\frac{1}{16}$ in. deep in S.A.E. 1035 Steel.

Fig. 2—Cuts $\frac{1}{16}$ in. deep in cast iron.

Fig. 3—Cuts $\frac{1}{8}$ in. deep in tool steel.

Fig. 4—Cuts $\frac{3}{16}$ in. deep in die-block steel.

The power consumption in operating the machine for the various lengths of stroke covering the range of the machine, when no cuts were taken, was determined and is shown comparatively in Fig. 5. The power consumption when operating at an approximate cutting speed of 26 ft. per min. at lengths of stroke 4, 8, 12, and 18 in. is indicated by the circled points. The maximum variation in power consumption at this cutting speed is 100 watts, and occurs between the 4-in. and the 8-in. stroke. The variation in power consumption between the 4-in. and the 18-in. stroke, however, is only 40 watts.

The figures taken together show that the power consumption for definite cuts, decreases for increases in length of stroke, but at a slower rate. No definite relation was established between the power consumption, physical properties, or the chemical analysis for the different materials.

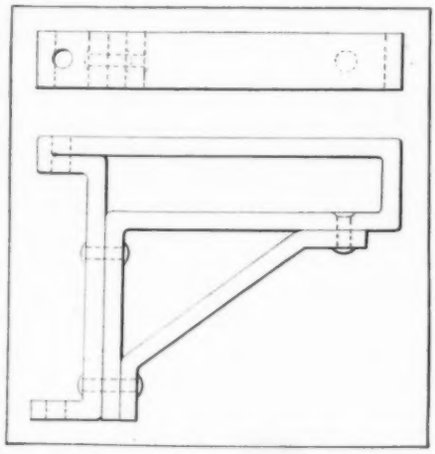
Time-Saving Devices in the B. & M. Railroad Shops—*Discussion*

By Elton Sterrett

THE stand shown in Fig. 5 of Ellsworth Sheldon's article under the title given above, on page 1014, Vol. 67, of the *American Machinist*, is much like one that supplanted the usual timber horses and plank scaffold in the shop where I was a member of the "top gang," and had to rig such a structure every time superheater units were to be installed or pulled. But our stand, like that of the B. & M., failed to provide scaffolding for the workmen, so simple but effective detachable brackets were made in the blacksmith shop according to the accompanying sketch. These brackets enabled us to use our stand not only as a support for the tube "dolly," but also to hold boards whereon to work.

Standard scaffold planking in the shop was 2x10-in. oak, surfaced all over, so the openings in the brackets were made to take that size of lumber. Made from $\frac{5}{8}$x2-in. strap iron, the fabrication of the brackets was simplified by the blacksmith, who formed the two ears for carrying the bolt holes direct from the strap stock, instead of using eye castings, riveted on, as was originally intended.

Angles were riveted in place by dropping $\frac{3}{4}$-in. bolts of the proper length through the two holes in the bracket ears and the corresponding lugs on the frame. Erecting the scaffold for a tube or superheater job was rated on the piece-work cards and, though it was possible to rig the scaffold more rapidly (and far more safely) with the brackets than by the old method, the rate was left unchanged. The foreman considered that the slight gain in erection time compensated the helper for his time spent going to the toolroom for checking out the brackets and bolts and for returning them after the job was done. It was found advisable to keep the brackets in the toolroom, as otherwise they were apt to be anywhere but on the stand; or, if on the stand, to have been damaged through rough crane-handling.



Brackets for scaffold for superheater work

The New Type of Industrial Leader

IN A recent address, Edward A. Filene listed five principal characteristics of the new type of industrial leader as follows:

1. He will base his policies and decisions on facts—not on emotions or opinions. He will use the best experts, laboratories, market surveys, statistics, trade associations, government research agencies, and highly skilled associates.

2. He will delegate details so that he will have time to consider the broader problems and future trends.

3. He will be internationally minded. He will see that his business is closely inter-related with, and dependent upon, the state of business in Europe and even farther away places. He will help other countries to be prosperous so that by buying his surpluses they will help him and his employees to be prosperous.

4. He will realize the basic fact that business is service and that a business can prosper only as it serves.

5. He will realize the possibilities that exist in still further development of mass methods of production and distribution. He will realize that there is as yet no apparent limit to the extent to which economies of making and selling can be carried. Every time he succeeds in reducing a cost he will be stimulated to search out still further ways to reduce that cost. He will not assume that because the cost has once, or a dozen times, been reduced, no further opportunities along those lines exist.

Lock Screws and Pressure Plugs

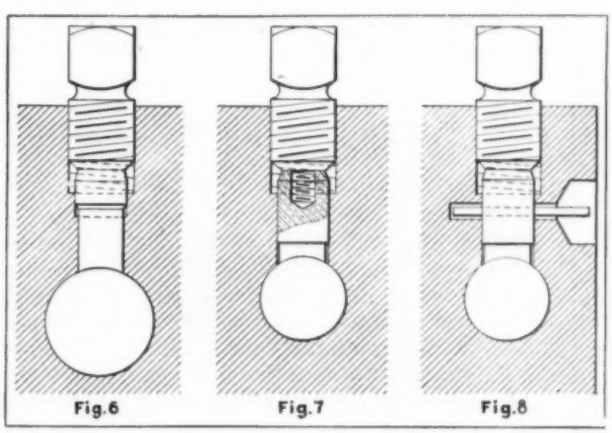
(Continued from Sheet 17)

Proper design and use of the pressure pin are decidedly important. The first consideration is the choice of the material for the pressure element, and a safe rule is to use some material which will not indent the part to be held. A tool-steel part of light-yellow temper may be held by a plug drawn to a deep blue. On a deep-blue part, again, nothing harder than soft steel should be used. Lead, fiber, or leather may serve where brass parts are to be locked. Soft copper makes a valuable pressure material on steel of all tempers under usual conditions. Steel should never be used against steel where there is any danger of sliding friction sufficient to cause heating.

One of the things that often discourages the mechanic with the use of the pressure plug is the fact that it will drop into the hole. If made a snug fit, as before mentioned, this is not apt to happen. A way to provide a positive insurance against such an eventuality, however, is shown in Fig. 6. To make the hole this way calls for a little more care, but this will amply pay for itself, especially where the plug would be hard to get at. In Fig. 7 is shown how a plug that must fit snugly, and cannot be reached from below, may be made removable. The method is to form a small tapped hole in the top so that an ordinary machine screw can be used to fish out the plug.

Sometimes it becomes desirable to install a pressure pin so as to have it loose, and at the same time held positively in proper alignment against dropping into the hole. A way to accomplish this is illustrated in Fig. 8. A cross-hole is drilled through the pin seat, and a slightly smaller hole to give a snug fit for a wire is drilled through the pin. Unless a knockout for the wire can be provided, some other means must, such as a countersink wide enough to allow the end of the wire to be seized with a pair of pliers.

A good way of obtaining the rounded gripping surface of the pin or plug, where the diameter of the part to be held is within the range of ordinary reamer sizes, is illustrated in Fig. 9. This, of course, requires that the plug be a snug fit in its seat.



Figs. 6-8—Methods of preventing plugs from dropping into the holes

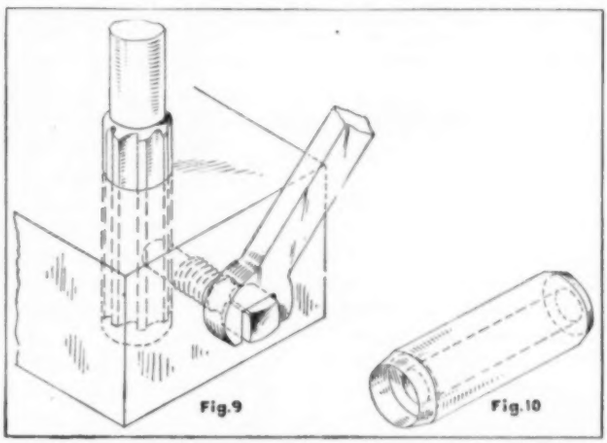
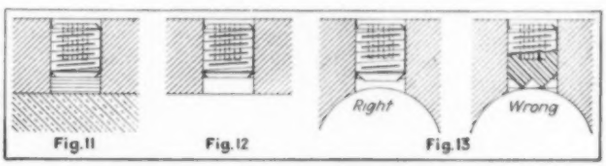


Fig. 9—Simple jig for cutting end of plugs. Fig. 10—Tool for punching soft plugs



Figs. 11-13—Applications of soft plugs

There remain some cases, that are particularly troublesome, namely, where the thickness of the metal in which the screw must be housed is so small that no head room is left for a plug of any appreciable length. Here the use of pads, made from sheet material of the proper kind, is the solution. A simple, short punch as in Fig. 10, made from drill rod, will allow such pads to be made readily.

The easiest case is where a flat surface must be held, as in Fig. 11. By the use of the pad method, this becomes a mere question of choosing the right pressure material. A paper pad is shown in Fig. 11, to hold brass or bronze, while a soft copper one is used on the steel surface in Fig. 12. With a rounded surface, the use of fiber or paper is not advisable unless the diameter of the part to be held is large, because these materials will not "flow." Lead, soft babbitt, or leather may be used where the piece to be held is brass or bronze. For steel, soft copper is an excellent friction material. Where pads are used, it is important that the point of the screw be as wide as possible, whether the surface held is straight or rounded. The views in Fig. 13 show why a cup-pointed screw should not be permitted, as it merely cuts the pad without producing any frictional hold worth mentioning.

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IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

An Unusually Simple Drill Jig

By Victor Carbonara

In drilling instrument cases and covers such as shown in Fig. 1, it is not necessary that they be interchangeable, but only that they be uniform in appearance and that there is sufficient metal around the tapped holes. In reality, however, there is very little variation between the different cases.

Instead of some type of box fixture to hold the case during the drilling operation, the drill jig consists of the block at the left, in Fig. 2, carrying the bushing and the locating or index plate at the right. The index plate

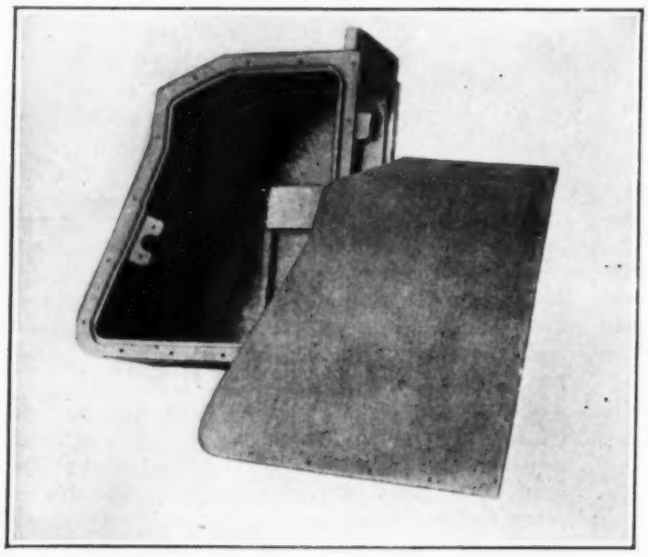


Fig. 1—The case and cover to be drilled

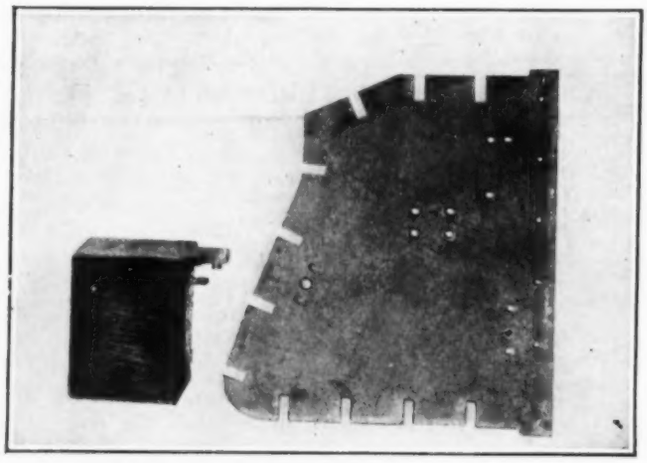


Fig. 2—Drill bushing and locating plate

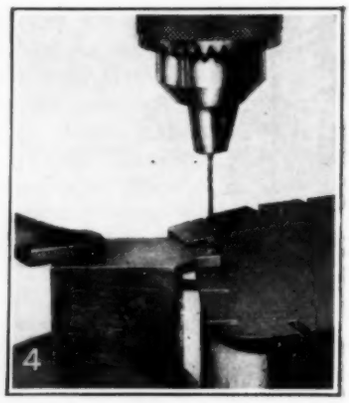


Fig. 3—Jig clamped in position. Fig. 4—How the work is located and drilled

is clamped over the cover, and the case is located by pins on the under side. The six holes on the right-hand edge are then drilled, the locating pins assuring the alignment of these holes so that they will be drilled in the center of the right-hand wall of the instrument case.

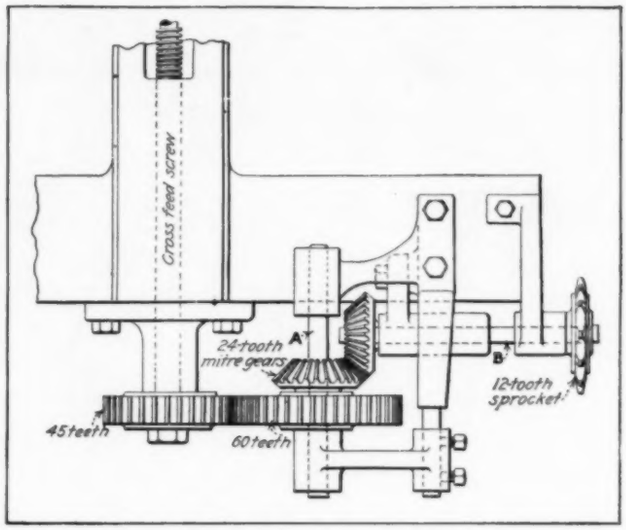
With the guide block clamped to the drilling machine table in its proper position, as in Fig. 3, the case, cover and guide plate are handled as shown in Fig. 4. The projecting lower end of the bushing fits into one of the slots in the guide plate and locates it, while the pin that projects from the block below the bushing acts as a stop against the outside of the case. This stop locates the wall of the case for each hole, so that all the holes will be drilled at the same distance from the external contour of the case at each point. As the cover and case are both drilled at the same time, slight irregularities in the casting do not affect the matching of the holes in both case and cover. After the drilling operation the holes in the case are tapped, and the cover, held down with a few screws, is ground to match the case.

Rigging a Lathe to Cut Scrolls

By S. L. St. John

Having occasion to cut a quantity of scroll plates for chucks—the pitch of the spiral to be $\frac{1}{2}$ in., with a groove $\frac{1}{4}$ in. wide and deep—and having no lathe that would generate with its own parts a spiral of more than $\frac{3}{8}$ in. pitch, we improvised the rig shown in the accompanying illustration to cut them.

All brackets, gears, sprockets, shafts, etc., used on the job are standard parts of machines that we build regularly, and no extra machine work whatever was necessary to prepare them for this rig. Alterations on the lathe, building up the extra mechanisms and tying them in place by torch brazing took about seven hours. After the



Improvised rig to cut spirals

rig went into service our average cutting time on 9-in. scrolls was 45 min., which we considered pretty good going under the circumstances.

The handle was taken off of the cross-feed screw of the lathe and a 45-tooth gear substituted for it. Meshing into and driving this gear was a 60-tooth gear on shaft *A*, which shaft was carried in bearings on both sides of the gear to give it a firm support. On the same shaft we put a 24-tooth miter gear, the mate to which was carried by shaft *B*, parallel to and above the feed rod of the lathe.

On the outer end of shaft *B* is a 12-tooth sprocket, driven by roller chain from a similar sprocket which we put on the feed rod. As the feed rod was supported close to this driving sprocket by its regular bearing in the apron of the lathe carriage, no work was necessary here except to slide out the feed rod, slip the splined sprocket on it and put the rod back again.

Most of the work was in building up the bracket on the wing of the carriage to support the gear shafts, and here also, as before mentioned, parts of other machines were employed and brazed together. The 60 to 45 proportion in the extra gears used gave us our required ratio. With other ratios, supplemented by the regular change gears of the lathe, we are now prepared to cut spirals of any reasonable pitch.

Multiple-Form Tools

By Henry Simon
Jena, Germany

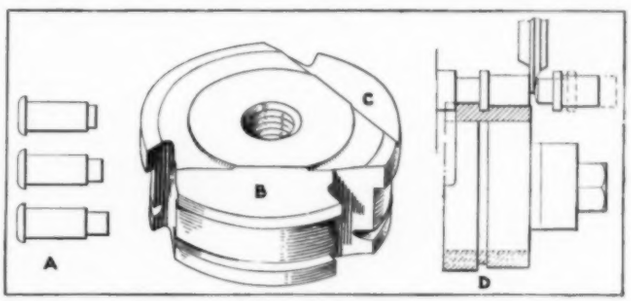
The three products shown at *A*, all alike in every respect except the length of the shouldered end, were to be made. The limits in general were close, and those on all length dimensions and the shape of the head were unusually close. Ordinarily this job would have called for three separate tools, which, in view of the close limits, would have been expensive to make.

To avoid this expense, one form tool was made for the longest of the three pieces. The tool was gashed in three places as shown in the sketch and two of the segments, *B* and *C*, were ground on the end-forming faces to correspond to the lengths of the shouldered ends of the two shorter pieces.

By using this one tool for all three products, the greatest uniformity with respect to all other length dimensions, as well as diameter and shape of the head was secured in a way that would have been very difficult if a set of three different tools had been used. It will be noted that ample clamping surface is left, while at the same time there is a generous amount of tool for each different form. As a matter of fact, though the order was repeated several times, not even one-half of the available tool was ever used up.

It will be noted that a positive clearance-angle of 5 deg. is ground into the end of each step, so that also in this respect the tool was complete. In fact, it was one case where every advantage of three different tools was combined and some other advantages added as one might say paradoxically, "at the expense of a saving."

In the example cited, the toolpost face of the form tool is the one that is "stepped." The same idea may



Two multiple-form tools

be applied to the rear face of the tool where products of varying head lengths have to be made. A form tool for two such products, identical as to every dimension except the length of the head, is shown at *D* in this case. It will be seen that in a cutoff-and-form job of this kind, all that is necessary in changing from one product to the other is to revolve and re-clamp the form tool and change the setting of the stock stop. Trifling adjustments only of form and cutoff tools are required, and an appreciable saving in setting-up time is added to the advantages already mentioned.

Dimensioning Drawings—*Discussion*

By James McIntosh

In an article under the title given above, on page 666, Vol. 67, of the *American Machinist*, J. C. P. Bode says that he prefers to use two sizes to indicate the maximum limits of some absolute preferred dimension.

It would appear that no saving in figures is evident when we consider that 2.5—0.0005 expresses all that is necessary to indicate the same requirements as to limits. It is quite usual to express limits that are not equal on both sides as $2.5^{+0.002}_{-0.000}$, which would make 2.501 the preferred size.

In the case of double dimensions, as $\frac{2.5005}{2.4995}$, neither size is to be preferred and for that reason alone they are of no real value in a drawing, or for use to define the preferred size of 2.5000, which should be and is the size to aim at.

The absence of limits may be construed as indicating anything from an absolute dimension to a general size. The presence of limits will afford a leeway of error, but there is this danger: Assume that there are 10 holes in

a row, and that the distance between centers is 2.5 ± 0.005. If all are $+0.005$, it would mean that the outer holes would be $0.005 \times 9 = 0.045$ over the actual distance required.

The danger of cumulative limits is quite evident, but there is the usual solution where care is exercised. If the spacing of the first pair of holes is $+0.005$, the aim for the distance between the next pair of holes should be -0.005, in order to maintain the preferred distance.

Reclaiming Superheater Units by Welding

By Jas. M. Vossler
Welding Instructor, S. P. Lines, Texas and Louisiana

As superheater units get old, the bends closest to the fire are the first parts to develop trouble. In such a case the practice has been to cut off the bends and apply new ones having threaded joints. It was realized that if some form of autogenously welded bend could be applied directly to the unit, a more durable and economical repair could be effected.

The first attempts to make welded bends on the ends of the superheater tubes were not successful, but after many trials the autogenously-welded bend here described was developed. In making the welded bend, the first operation is to cut off the old bend with a cutting torch

Fig. 1—End of unit ready for closing. Fig. 2—Tubes heated and bent together. Fig. 3—Completed bend cut open

and to shape the superheater unit as shown in Fig. 1. The tubes are then heated just back of the bevel and are bent together as shown in Fig. 2. The cut ends of the unit tubing are heavily rapped with a hammer to loosen all scale that may be therein. The two tubes are then placed in position and tack welded to keep them in alignment.

The next operation is to weld the lengthwise seam. Considerable care should be taken with this weld. The unit tubing is too thin to justify beveling and care must be exercised to see that the fusion extends entirely through the seam. After the welding of the lengthwise seam has been completed, the round hole left open at the end, about $\frac{7}{8}$ in. in diameter, must not only be plugged, but must be built up heavily for reinforcement.

A unit end completed is shown in Fig. 3. It has been

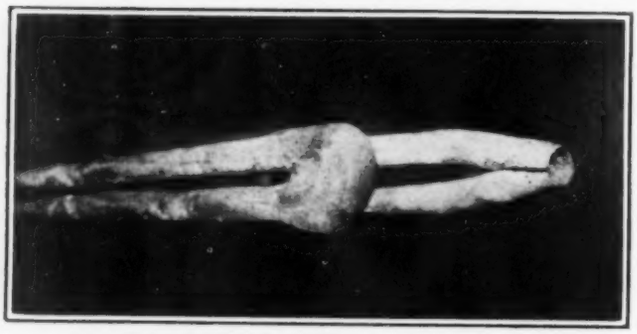
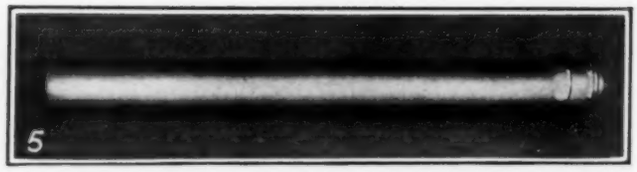


Fig. 4—Bend prepared for welding



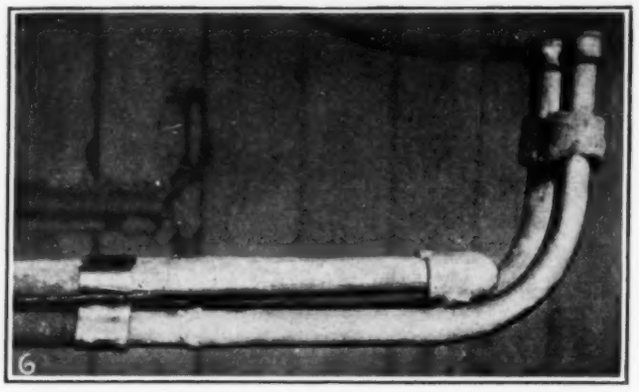


Fig. 5—Ball joint forged on neck. Fig. 6—Neck bent and welded to unit

sawed and hinged in a door-like manner so that the inside could be seen. It will be seen that the cross-section at the point of union of the two tubes in the welded bend is very liberal, being considerably greater than the cross-section of the tubes. The time required to complete the bend will average about 45 min., including the preparation work. The autogenously-welded unit bend is far superior to the screwed-joint bend and has proved itself at least equal to any other form of superheater bend. In Fig. 4 is shown a bend ready to be welded.

The objection may be raised that the efficiency of the unit is lowered, in that its heating surface is decreased when the old bend is cut away and the new bend is constructed as described above. This, of course, is to some extent true, but the decrease is very slight and it is a simple calculation to prove that the loss in efficiency is not worthy of consideration. It can be further seen that the longer the unit, the smaller the percentage of efficiency lost.

Another part of the superheater unit that is found to wear out before the rest is the neck. Often the neck is found to be thin on the fire side of the upper portion of the curve. When the condition of the rest of the unit is good enough to justify the replacement of the neck section, a new neck can be prepared by forging the ball joint on a piece of proper size tubing in a forging machine. After the forging operation, the neck is bent into proper shape and is welded onto the unit. Fig. 5 shows the new neck after the ball joint and collar have been forged, while Fig. 6 shows the new neck properly bent and welded in position on the unit.

Two Designs of Sub-Presses

By Edward T. Heard

In the illustrations are shown two designs for sub-presses. The one illustrated in Fig. 1 has a round ram in which three half-round grooves are milled lengthwise. The hole in the upright is tapered and has three half-round grooves planed or broached in it. The fit between the ram and the hole is made by a babbitt lining cast in place, the half-round grooves acting as keys to keep the lining from turning. The grooves in the ram

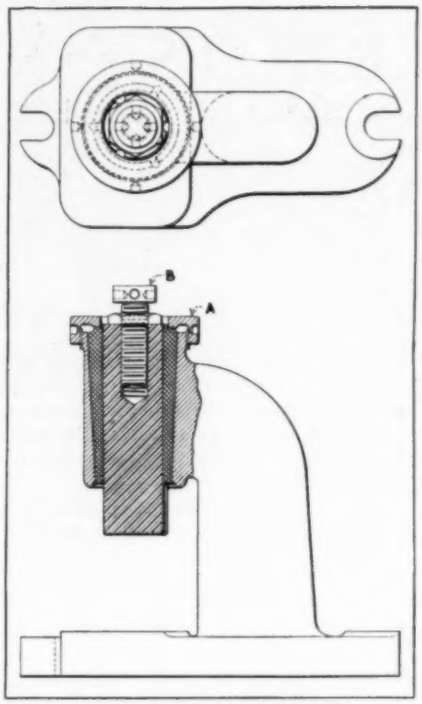


Fig. 1—Sub-press with cylindrical ram

also act as keys to prevent it from turning. When the babbitt lining wears, it can be taken up by forcing it down in the taper hole by screwing down the cap *A*. The head of the screw *B* fits in a slot in the press ram and after it has been adjusted to position the sub-press ram, it can be secured by a locknut. The sub-press illustrated in Fig. 2 has a rectangular ram. It is let into a recess in the upright and is confined therein

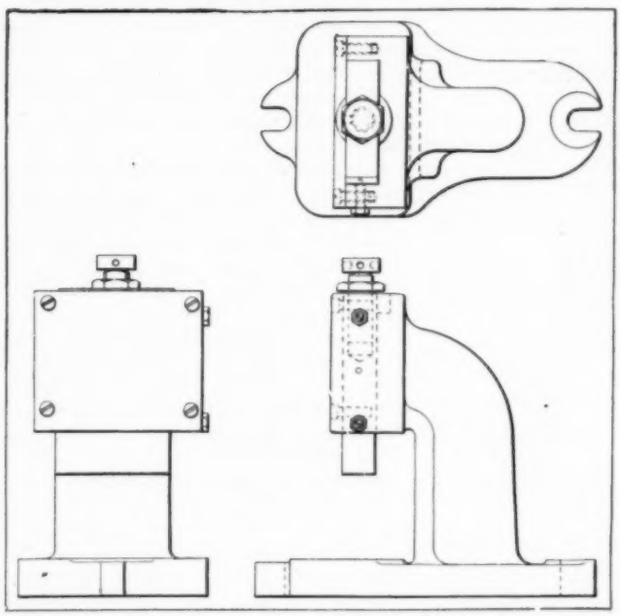


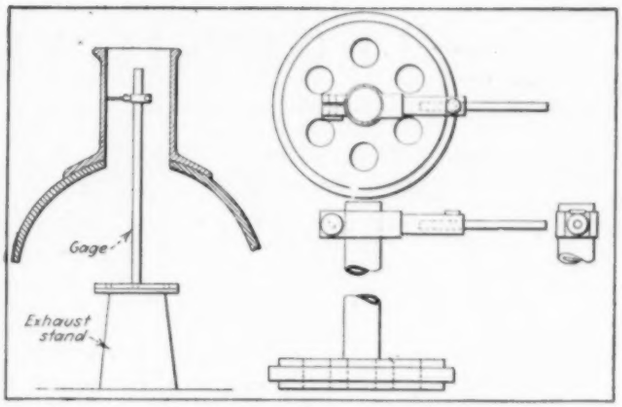
Fig. 2—Sub-press with a rectangular ram

by a cover plate. An adjustable gib is provided to take up side wear. Wear back or front can be taken up by scraping the abutments to which the cover plate is attached. The screw in the top of the ram is for the same purpose as that shown in Fig. 1, and is used in the same manner.

Gage for Aligning Smokestacks

By J. H. Hahn

When placing smokestacks in position, the gage shown in the accompanying illustration will be found very handy for checking the location of the stack to see that it is central with the exhaust stand. The gage is mounted on a base, the exhaust stand tip is removed and the base of



Aligning gage for smokestacks

the gage is clamped to the top of the exhaust stand. The spindle is then screwed in the base and the adjustable pointer at the upper end of the spindle is set for the inside diameter of the stack. The stack is shifted until the gage touches it on all sides. The location of the stack is then marked on the smokebox, and after it has been bolted in position, the location should be rechecked.

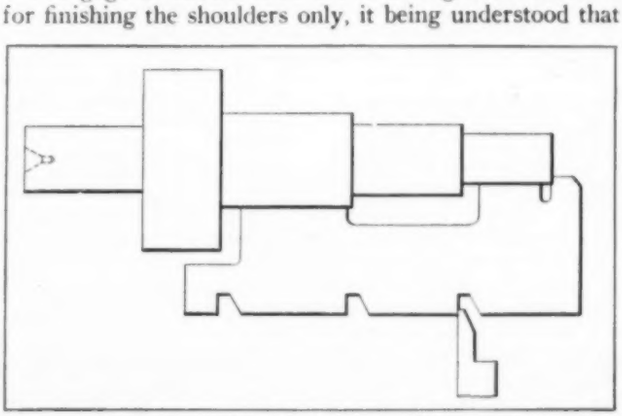
The use of this type of gage will eliminate the cutting out of smokestacks due to the exhaust striking on one side. Also it will produce better front end drafts, thus aiding the steaming qualities of the locomotive. The gage is easily made and is inexpensive. The length of the spindle and other dimensions will be governed by the design of the exhaust stand, the smokestack and the size of the locomotive the gage is to be used on.

A Tool-Setting Gage

By S. W. Sullivan

In the illustration is shown a gage for setting the tools for shoulder work in Lo-Swing lathes. It is also useful where shoulders are to be finished in engine lathes or other single-tool machines.

The gage as shown is in use in a single-tool machine for finishing the shoulders only, it being understood that



Gage for setting tools on shoulder work

the diameters of the work have been finished in a previous operation. The use of such a gage is not limited to the lathe, or to cylindrical work, but can be extended to the milling machine, planer and shaper for setting cutters or tools either singly or in a gang.

Gages of this class should be stamped with the drawing numbers of the jobs on which they are to be used. That they should be hardened and ground, goes without saying.

· TECHNICAL · ABSTRACTS ·

The Problems of Lubrication Presented by Higher Operating Pressures

The selection of a suitable lubricant for frictional elements depends upon the operating pressure, speed, and temperature of the parts involved. Of these factors the operating pressure is the criterion. Therefore, the lubricant selected must have sufficient viscosity to prevent being squeezed out and permitting a metal to metal contact.

Viscosity is a measure of the relative fluidity or body of the lubricant. It is important to remember that viscosity varies inversely with temperature. In other words, the higher the latter the more fluid will be the lubricant.

Two examples of equipment operating under heavy bearing pressures are the boring mill and the metal press. Each is a distinct problem, since in the first the pressures are steady, while in the second they are intermittent. The first condition is more complex because of the bearing temperature. However, the pressures existing on the down stroke of a metal press may be from 4,000 to 5,000 lb. per sq.in. for a brief period. A suitable lubricant for this condition must have adequate body and adhesiveness to resist being squeezed out.

For average conditions, i.e., with pressures below 400 lb. per sq.in., a highly refined non-emulsifying straight mineral oil having a viscosity of from 180 to 200 seconds Saybolt at 100 deg. F. will normally meet operating requirements. In certain operations, however, thrust pressures in excess of 1,000 lb. per sq.in. may occur. Such a condition requires a straight mineral steam cylinder oil of a viscosity of from 130 to 160 seconds Saybolt at 210 deg. F.—*Lubrication*, January.

Antifriction Bearings and High Spindle Speeds

Antifriction bearings to be successful must show many times the life of the older form of bearings, or a considerable reduction in maintenance cost. Also, the application must be more foolproof. The important item, therefore, is absolute minimum of friction, as friction means wear and wear definitely defeats accuracy and quantity production. Heat, also, is an important item on precision machines, as such machines do not produce close tolerances consistently until the minimum operating temperature is attained.

Rigidity is highly desirable in most applications to machine tools. In some of the more recently designed machines greater weight has been added for a given operation, and in many cases where vibration was present experience has shown that the additional weight has in large measure overcome the trouble. Mention is made of this for the reason that bearings have been criticized in many cases when the actual trouble was elsewhere.

In order to obtain best results with antifriction bearings it is necessary to analyze conditions as carefully with respect to the bearings as with any of the other elements. It is earnestly recommended that anyone contemplating the use of antifriction bearings should have the entire problem studied very carefully by the bearing manufacturers.—*Abrasive Industry*, February.

"The Lone Eagle"

The Ryan Mechanics Monoplane Company, of Los Angeles, Calif., has produced an all welded steel tube airplane which weighs one-eighth less than the same design if built of wood. The wing, fuselage, and tail surfaces are built entirely of welded steel tubing covered with fabric in the usual manner. The tubing is of chrome-molybdenum steel with a tensile strength of 95,000 lb. per sq.in., and is unaffected by heat or welding because the original temper of the metal returns as the weld cools.

All structures in both wing and fuselage are of Warren truss construction. The wing spars are Warren truss with the wing ribs welded to them and Warren truss compression members welded in. The main spar members are reduced in diameter as the spar approaches the wing tip, each successive tube telescoping into the former where it is fishtailed and welded in. The tubing sizes in the spar vary from $1\frac{3}{4}$ in. with $\frac{3}{32}$-in. wall at the center of the spar to $\frac{3}{4}$ in., 20-gage at the wing tip, while the truss members in the spar vary from $1\frac{1}{4}$ in., 18-gage at the center to $\frac{1}{2}$ in., 20-gage at the end. The wing ribs are built up in nineteen jigs and are welded to the spars by cutting a section of each rib and then fitting it on the spar and welding in place.

Although the wing area is 262 sq.ft., the weight of the wing structure uncovered is but 354 lb., or 1.34 lb. per sq.ft., which is exceptionally low for a full cantilever wing.—Charles F. McReynolds, *Aviation*, Feb. 20.

Evaluating Quality in Heat-Treated High-Speed Steel by Means of the Milling Cutter

It was only after a careful resumé of their work and the requirements of the Western Electric Company that it was decided to use the milling cutter test, because the milling cutter is our most important cutting tool. In selecting a milling cutter for this test, the following points were considered:

1. Each tooth must be capable of removing a fairly large, deep chip.

2. The face of the tooth form must be undercut, i.e., have sufficient rake so as to give a free cutting action, more nearly like the action of a lathe tool and differing from the pushing or dragging action of the radial-faced tooth milling cutter.

3. Ample clearance must be provided for the chips to clear themselves.

4. Chatter, resulting from a cutter having too many teeth causing the chips removed per tooth to be so small that the cutter tends to slip over the surface of the work and spring the arbor, must be minimized.

5. It was felt that the life of the test cutters would be unduly prolonged if spiral-shaped teeth were included.

The coarse-tooth type side-milling cutter was selected. This form of cutter has the added advantages of being relatively inexpensive and lends itself readily to commercial manufacture.

The milling machine used was a Brown and Sharpe 2-B Heavy type with automatic longitudinal, transverse, and vertical feeds. It was run at a spindle speed of 136 r.p.m. which, with a $3\frac{1}{2}$-in. cutter, gave a cutting surface speed of 122.7 to 124.2 ft. per min. The table feed was 5 in. per min. and the depth of cuts 0.125 inch.

A portable graphic recording polyphase wattmeter was connected in the circuit with the motor of the milling machine and after several trial runs "deadlines" were established which governed all future tests. These points were chosen by determining the power increase required for cutting by a tool which, judged dull, could still be resharpened by the removal of approximately 0.010 to 0.015 in. As the cutter dulled, the increased load on the motor was automatically recorded, and any question of personal opinion as to the relative condition of the cutter was removed.

The test logs were forged chromium-nickel steel (S.A.E. 3345) bars, $3\frac{1}{2}$ in. square and 30 in. long, oil quenched and tempered to 285-302 Brinell. Four longitudinal cuts 0.125 in. deep were taken across the bar, after which the five remaining projections were removed. This was done by shifting the table transversely under a surface spiral mill mounted on the same arbor as the test cutter. The test bar was then moved under the test cutter and four more cuts taken, etc., until the cutter was dull. In this manner each cutter was at all times removing the same amount of metal and also had the same amount of side-cutting friction.

The coolant used was a soluble oil and water mixed in the ratio of one to sixteen. Its flow was regulated by a needle valve which permitted one drop per second to fall on the rotating cutter. This was determined after several trials

as being satisfactory for the purpose and did not unnecessarily prolong the life of the cutting tool.

The cutters used for establishing the ability of this test to duplicate results were made from selected material and heat-treated in a gas-fired double-deck furnace, automatically controlled by means of proportional mixers and recording controllers to permit a temperature control of 2,350 deg. F., ± 15 deg. All cutters were preheated at 1,700-1,750 deg. F., then brought up to 2,350 deg. F. ± 15 deg., quenched in oil and tempered for two hours at 1,050 deg. F. ± 10 degrees.

CONCLUSIONS

1. Cutters of the same steel hardened by the same method check within limits that are sufficiently close for test purposes.

2. No cast cutter has been found to give results comparable to standard high-speed steel refined by suitable working.

3. Cutters hardened by patented or salt bath processes have not given results comparable to standard high-speed steel hardened by the open-fire method.

4. In only a very few cases has the cutting efficiency of the tools failed to increase from the first to the third, fourth, or fifth grind. The maximum cutting efficiency is generally reached by the third or fourth grind, depending on the amount of metal removed per grind.

5. The question of low runs on the first two grinds of chemical analysis of high-speed steel, and of hardening and tempering temperatures are items that are being investigated further.—J. B. Mudge and F. E. Cooney, *Transactions* of American Society for Steel Treating, February.

Winter-Time Ventilation

Winter ventilation in present-day industrial plants has become a paramount issue. The word ventilation immediately implies the supplying of clean, fresh air to a given zone. Not every case necessitates filtered air but for winter ventilation the fresh air must be tempered before it is supplied to the room or building in question. A temperature ranging between 65 and 70 deg. F. is considered the most favorable temperature for efficiency and comfort. But temperature alone will not accomplish results because fresh air is the main antidote against all trouble.

When a large force is employed in a low-ceiling type of building, naturally more air per unit volume of building content must be provided than for a small force in a building with high ceiling.

Consideration must be given to processes such as the common acid tanks, which emit offensive and obnoxious gases, and pneumatic conveying systems by means of which shavings and grinding dusts are disposed of. Exhaust systems are usually installed to care for these contaminators, but their efficiencies are entirely dependent upon the supply of fresh air to make up for the quantity which it is necessary to remove.

When considering the exhaust systems, the method of determining the amount of heat or the manner in which the heat is to be supplied depends upon the size and type of the exhaust system. There are three prominent types of heating systems, namely, direct radiation, unit heating, and central-blast heating. The type named last employs a large centrifugal fan with the necessary group of blast radiators through which the air is drawn, heated to a predetermined temperature. The air is distributed throughout the building by means of ducts leading from the fan discharge.—By A. P. Darlington, *Industrial Engineering*, January.

The Outlook for Aviation

There have been three distinct phases in the development of the art of flying—pre-war, war, and post-war. During the pre-war stage the few pilots that were bold enough to take the air were satisfied to be able to fly, regardless of the lack of comfort and the hazards. With the advent of the war the airplane was called upon to perform new and unusual duties. There was a continual demand for more and more speed, greater maneuverability, higher service ceilings, more comfort for the pilot, and sturdy, rugged construction.

At present we find a preponderance of enclosed cabin monoplanes that are similar to the type used by Colonel Lindbergh in his flight from New York to Paris. It seems strange that the five-passenger, enclosed-cabin biplane has been almost entirely supplanted by the monoplane. I do not believe, however, that the monoplane will always predominate in this field, or in the field of the large three-engined passenger transport planes. Biplane construction possesses certain definite advantages over the monoplane type which cannot easily be overlooked. Among these are the short run necessary for the take-off and the comparatively small space necessary for landing.—*Machinery*, February.

Salary Administration in the Commonwealth Edison Company

A program set up for the purpose of centralizing the control or regulation of payroll precedure can be expected to embody in some form most of the following items: Job analysis, job description, job grading and classification, salary and wage schedules, and on these items as a base, salary and wage control procedure including budgeting of requirements and centralized supervision.

The foundation of any such program is a complete analysis of all jobs or positions in the company. It should include a study of the relation of each job to other jobs in the same department and in other departments. The results of the job analysis are set up in standardized job descriptions. From these job descriptions it is possible to determine a method of grading and classification of jobs. When the grading and classification are completed, it is only a matter of adjustment to set up for the entire organization salary and wage standards based on the value of the work to be performed. With such standards available, specialized control of wage and salary adjustment is possible. A systematic payroll precedure is the first item to be included in such control. Salary increase budgets may be used effectively. The payroll procedure should be headed up through the supervision of either a staff officer of a committee so as to insure uniform interpretation of rules and schedules.

In the Commonwealth Edison Company it has been the policy to carry on as much of this work as possible within the organization. It is believed that if the departments are to function efficiently, the department heads must be held responsible and that it is neither fair nor good business to throw around them restrictions which will make it impossible for them to function properly.—A. B. Gates in *The Management Review* for February.

Mechanical Handling of a Variety of Products Cuts Costs 25 Per Cent

Material handling methods have been successfully applied by the Hobart Brothers Company at Troy, Ohio, one of the smaller metal-working plants, to all phases of the manufacture of six different lines of products. Although this company's transportation problem is made intricate by a variety of materials to be handled, a reduction of 25 per cent in manufacturing costs has been achieved. All operations from the receiving of raw materials to painting and shipping are taken care of by roller and belt conveyor systems, while hand-lift and electric trucks perform supplementary duties and carry special orders. The resulting speeding up of operations has increased the plant output without the addition of extra floor space. The efficiency of the workmen has been raised materially through bringing the work to them at the proper working level.—Burnham Finney, *Iron Age*, Feb. 23.

Spraying Troubles—Fire Hazard

The widespread application of finishes by the spray method has seriously increased the fire hazard in the industries concerned. The materials which lend themselves to spraying such as paint, varnishes, pyroxylin lacquers, oil stains, and shellacs all give off highly flammable solvents which combine with the air to form gaseous vapors. A dust of the spray material creates an explosion hazard through the possibility of spontaneous combustion. To offset these dangers of a flash hazard or explosion, a properly designed ventilation system should be installed. Rubbish and dried spray material should be cleaned up daily. Finally, all mixing of materials should be done with as small quantities as possible and stored carefully.—*Safeguarding America Against Fire*, February.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

An Engineer in the White House

NOW that Herbert Hoover has made the definite announcement that he is a candidate for the presidency of the United States it is appropriate to consider his qualifications, attainments and general aptitude for the honor on the sole basis of the best interests of the country.

His work in the Boxer Rebellion, as head of the Belgium Relief Commission, as National Food Administrator and as head of the A. R. A. in the Russian famine crisis; his direction of the Mississippi flood relief work stamp the man. Can we afford not to have in the White House a man with such a record of achievements?

For his sterling Americanism; for his broad international viewpoint—absolutely vital in the next few years; for his outstanding ability as an economic thinker and constructive organizer of human endeavor, the *American Machinist* stands in support of Herbert Hoover for President of the United States.

The country needs him to direct its destinies, and the rest of the world will be the better off when he undertakes that direction. National problems are pressing enough, in all conscience, but they will be dwarfed by international questions in the immediate future. For that reason Secretary Hoover's superlative grasp of international relations points him out as the candidate best qualified for the office.

On the domestic side Mr. Hoover ranks at the very top for his constructive conception of the needs of business and industry and for his sane attitude toward the troubles of the farmer. He has done wonders for American commerce, and his achievements as the builder of the modern Department of Commerce and as the confidential adviser of two presidents have given him an insight into national affairs possessed by no other man. Those who have been closest to him have been amazed at the accuracy with which, in 1919, he foresaw the changes that have since taken place in the administrative viewpoint.

The leaders of business and industry, for whom Mr. Hoover has done so much, and the farmers, for whom he can do even more from the White House, will do well to see to it that partisan politicians do not prevent so able an administrator, so distinguished an engineer and so sound an economist from devoting his talents to the service of his country as its chief executive.

The Cost of Special Machines

OPINIONS differ as to the trend regarding the use of highly special machines. It is quite probable, however, that concerns with a sufficiently large output will continue to have machines designed and built to produce one or more special pieces and of little or no value for other work.

It is quite natural for the user to ask the builder of similar machines to make the special machine for him. Too often, however, he does not seem to appreciate the cost of building a single machine of special design, even though it may resemble the standard line. For this reason he frequently is not willing to pay what the builder should receive, especially when the builder is also the designer.

Misled by the possibility of securing further orders for the same machine, the builder many times fails to include all of his legitimate costs in the price of the first machine. The additional orders seldom come, however. Cases have been known where further orders were given to other concerns in order to prevent the profit that might have been made.

The builder who engages in furnishing special machines should neither overlook any of the costs involved, nor forget to include them in the price. Even then to find an actual net is sometimes quite a problem.

An Antidote for Specializitis

UNDER the above title Dr. Edwin E. Slosson, director of Science Service, tells in *McGraw-Hill Book Notes* of the plan of that company to publish a "Frontiers of Science Series." Dr. Slosson will be the editor and he will be assisted by Dr. Frank Thone and advised by the eminent scientists connected with his own organization. It is proposed to prepare books, on all of the various sciences, that will fit in midway between the predigested "Outlines" and the deep technical treatises. Thus the man who has had to specialize, on metal working for example, can broaden his viewpoint by reading sensible, understandable books on biology, chemistry, astronomy and all the other sciences. Such a series of books as this has long been needed and it is to be hoped that the finished product will measure up to the requirements.

· SHOP · EQUIPMENT · NEWS ·

Consolidated Heavy-Duty Center-Drive Axle Lathe With Oilgear Feed

OILGEAR feed has been applied to the carriage of the heavy-duty center-driven axle lathe made by the Consolidated Machine Tool Corporation of America, Rochester, N. Y. The machine is shown in the accompanying illustration. The application of hydraulic feed to this type of machine represents an advance over previous designs. Feed gearing has been eliminated and the carriages are handled entirely by power, thus speeding up production and reducing manual effort of the operator.

Positive feeding pressure is applied to each tool by oil cylinders attached to the under side of each carriage at the front and back. This application of feed pressure directly under the tool is held rigidly to permit very heavy cuts and feeds.

Each carriage is provided with adjustable automatic stops. Control levers for setting the rate of feed and for power traversing the carriages are located at the center of the machine where they are always within reach of the operator. Power traverse is at the rate of 6 ft. per minute. Any feed up to ½ in. per rev. is available.

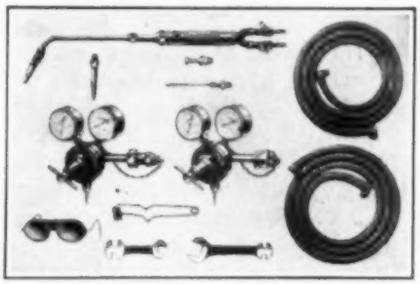
Main drive is either by an adjustable-speed motor through a single train of gears or by a constant-speed motor through a three-speed gear box. The center driving head is equipped with Sykes herringbone gears. The two Oilgear pumps are driven by one 3-hp. constant-speed motor. The machine shown in the illustration is equipped with a 35-hp. adjustable-speed motor for especially heavy duty.

Prest-O-Weld Welding Outfits

For automobile repair shops and sheet metal shops for low-priced assemblies, three Prest-O-Weld welding outfits, designated as the Type W-101-A auto repair outfit, the Type W-102-A general purpose outfit, and the Type W-102-B welding outfit, have been placed on the market by the Oxweld Acetylene Co., 30 East 42nd St., New York City.

These outfits are made possible by the addition to the Prest-O-Weld line of two small, two-gage regulators, Types R-106 and R-107, and two special blowpipe tips, one for heating and brazing and one for radiator soldering.

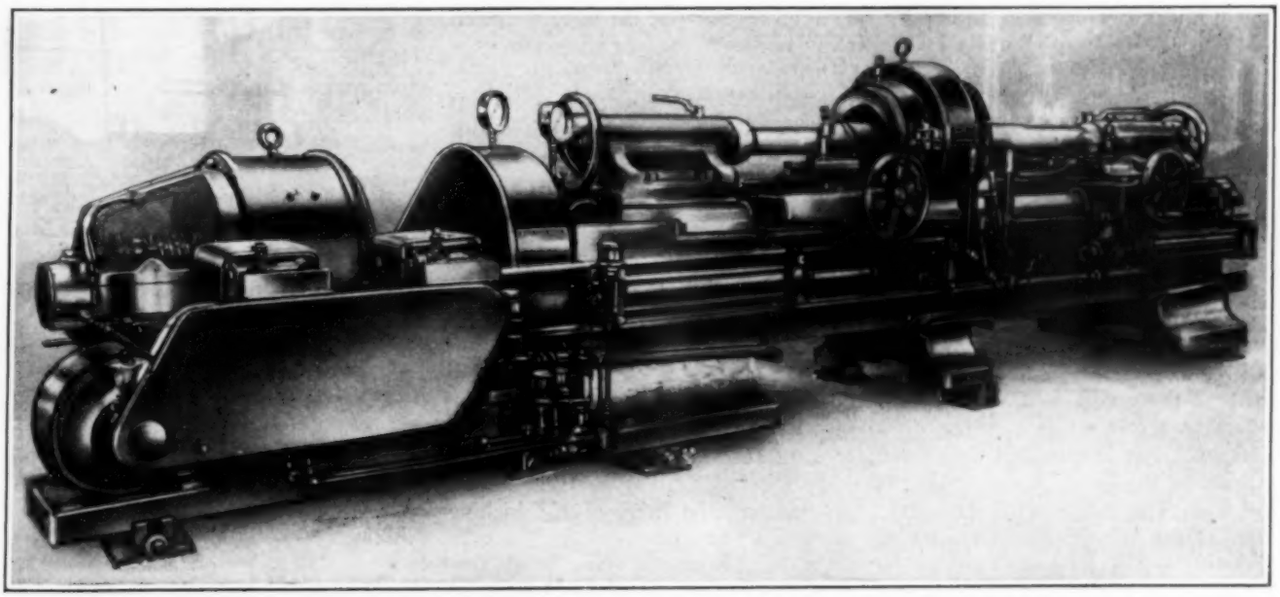
The Type W-101-A auto repair outfit is for the garage that has only an occasional welding job but needs a large-size blowpipe for frame straightening. For this purpose a No. 10 tip is included which is also suitable for reasonably heavy welding operations. A No. 6 tip is provided for every-day welding jobs. A special heating tip and a radiator soldering tip, which consume acetylene only,



Prest-O-Weld Type W-101-A Welding Outfit

are designed for light heating, brazing and soldering operations. The radiator soldering tip enables the operator to solder the leaves of a radiator in places that would be inaccessible with the ordinary type of welding tips.

The Type W-102-A general purpose outfit is for welding, decarbonizing, heating, soldering, brazing, lead burning and radiator repair. Five welding tips and a decarbonizing blowpipe, as well as the heating and radiator soldering tips, are included



Consolidated Heavy-Duty Center-Drive Axle Lathe with Oilgear Feed

in this general purpose welding outfit.

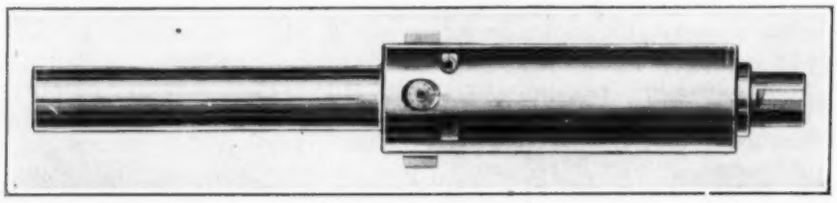
The type W-102-B welding outfit is recommended for auto body and fender work and for welding light and medium castings. It is also suitable for the sheet metal shop and for light production welding such as skylight and cornice work, building sheet metal furnaces, fabricating tanks and steel barrels, welding the corners of steel sash window frames and similar work. This outfit, which includes five welding tips, is particularly adapted to production processes because the light weight of the blowpipe with its light $\frac{3}{16}$-in. hose does not tire the operator even on continuous work.

By the addition of a cutting attachment any of these three outfits may be used for cutting wrought iron or steel.

Larkin Expansion Boring Bars

A SIMPLIFIED expansion boring bar has been recently placed on the market by the Larkin Packer Company, St. Louis, Mo. These bars are strictly production tools designed to maintain accuracy of bore and to compensate for wear on the cutters by means of micrometer adjustment. A wide range of cutter expansion and ease of adjustment are the principal features.

Four main parts compose the expansion unit: An adjusting screw graduated to 0.001 in.; a wedge, threaded on the adjusting screw that serves to expand the cutters; a thrust collar for piloting the adjusting screw; and a removable bushing for retaining the expansion units in the body.



Larkin Expansion Boring Bar

The method of expanding the cutters is simple and is designed to provide accuracy together with rigid construction. Wedge action, with a bearing above and below the center on angle of the cutters, forces the cutters uniformly outward as the micrometer screw is turned. The hardened wedge, which is prevented from rotating by keyways, is threaded on an adjusting screw and travels backward and forward as the screw is turned. This adjusting screw while rotating does not travel, but is confined in a fixed position at the head by the fit of the bushing. The thrust at the bottom is taken by a hardened and ground thrust collar which serves as a centering unit for the conical point of the adjusting screw. It also serves to support the adjusting screw on dead center. The wedge is entirely threaded on the adjusting screw at any point of expansion and it has a circular bearing in a reamed hole along its entire travel, thereby preventing side play or movement under strain.

The entire expansion unit is accurately fitted in place from the front of the bar and retained with a removable bushing which confines the units within the body and gives access to the adjusting parts for purposes of replacement without damaging the bar. With this assembly it is said that the torsional strength of the bar body has been materially increased, as only a portion of the body is drilled and reamed to accommodate the adjusting parts. As the wedge moves upward when adjusting screw is turned, all the strain of the cutter thrust is carried to the bottom, where the thrust-carrier collar carries the screw pressure.

A unique feature of the bar is the method of locking the cutter in place. A hardened and ground eccentric locking screw with threads at both ends, serving as pilots, employs a positive cam movement for clamping each cutter in its slip-fitted slot. The cutters are held immovable until the locking screw is released. To provide a quick method for removal of the cutters, the head of the locking screw has an indicator mark set at zero, located on the point where the cam pressure on the cutter is released. Each cutter is independently held, and right- and left-hand threads throw the locking movement inwardly against the wedge. No other units are employed in locking so that a minimum amount of stock is removed from the tool body.

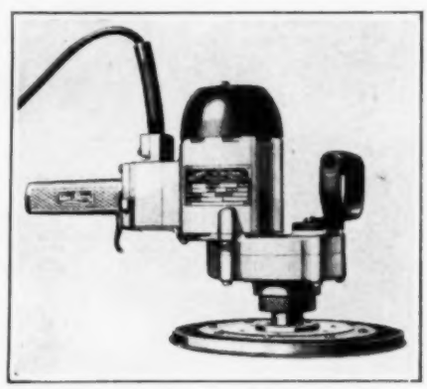
All boring bar bodies are made from selected steel, properly heat-treated. Cutters are made of high-speed steel uniformly heat-treated. Every cutter is tested for uniform hardness. All cutters are made to standard dimensions. When worn undersize beyond the range of expansion in one bar, they can be used in smaller bars of the same slot dimensions. Correct rake angles and relief with special tempering, is provided for boring various classes of material. Ten stock styles and sixteen stock sizes are available for various boring operations.

Van Dorn "Flex-Disc" Grinder

A portable grinding and sanding machine that will surface both metal and wood, known as the "Flex-Disc" grinder, is announced by the Van Dorn Electric Tool Company, Cleveland, Ohio. Ample power and compact design are featured.

The motor and general construction is the same as that embodied in standard Van Dorn drills. The motor has a no-load speed of 2,400 r.p.m. and can be operated on either alternating of direct current.

The machine is equipped with a 9-in. flexible rubber pad which serves as a base for $9\frac{1}{4}$ in. abrasive disk. This flexible disk feature makes possible grinding or sanding on curved surfaces. A 6-in. flexible rubber pad is also made for use with this machine. When the $9\frac{1}{4}$-in. abrasive disks become worn they may be cut down



Van Dorn "Flex-Disc" Grinder

and used on this 6-in. flexible pad.

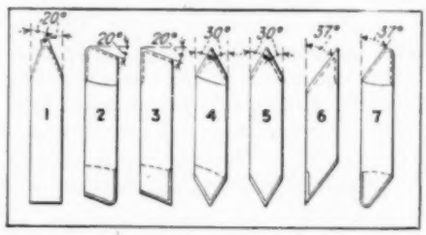
The grinder may be converted into a polishing machine by interchanging for the flexible rubber pad a lacquer polishing pad of heavy felt covered with a removable cloth bonnet. Five removable cloth bonnets are supplied with each polishing pad. These bonnets may be laundered when they become soiled.

The regular equipment furnished with this Van Dorn Flex-Disc grinder includes a 9-in. flexible rubber pad, twelve 9¼-in. abrasive disks of Nos. 16, 24, 36 and 50 grit, and 15 ft. of cable with plug. The grinder can be furnished for use on 110-, 220- or 250-volt circuits.

Noyes Semi-Finished or Ground Tool Bits

Tool bits, either semi-finished or ground, with standard clearances, are now available from the H. F. Noyes Company, formerly the Bridgeport Cutter Works, Bridgeport, Conn. Semi-finished bits, in shapes Nos. 1, 3, 5 and 6, can be quickly finished into any desired shape for either lathes or planers. They are shown in the accompanying illustration.

Bit No. 1 is a round-nosed tool with clearance of 15 deg. on both sides, but



Noyes Semi-Finished or Ground Tool Bits

not on top. No. 2 is a roughing tool for either right or left hand and has clearance on both sides of 15 deg. and top rake of 15 deg. No. 3 is a straight-sided tool, finishes either right or left, and has left clearance of 10 deg. and right clearance and top rake of 15 deg. This bit may be modified to No. 2 by rounding the nose. No. 4 is a side tool, double-ended, with clearance of 10 deg. and right clearance and top rake of 15 deg.

Bit No. 5 is a thread-cutting tool with clearance on both sides of 15 deg., but none on top. It finishes either right or left and can be modified to No. 4 by slight grinding. No. 6 is a planer tool for corners, either right or left, with clearance on both sides of 10 deg., but no top rake. No. 7 is a roughing tool for planers with clearance on both sides of 15 deg. and top rake of 15 deg. It can be modified from the preceding tool. These bits are made from best high-speed steel in sizes from ¼ to ½ in. and in lengths 2⅛ to 4¼ inches.

Cincinnati Electrical Tool Company Heavy-Duty Floor Grinders

Announcement is made by the Cincinnati Electrical Tool Company, Cincinnati, Ohio, of three heavy-duty floor grinders, 5, 7½, and 10 hp., designed for the heaviest grinding in foundries, steel mills, railroads and forge shops and other places where grinders are used for continuous service in production work. The motors are fully inclosed and the spindle is mounted on four Timken roller bearings running in oil. Proper provision has been made for excluding dust and dirt from bearings, which are adjustable for wear.

The wheel guards are of cast steel and comply fully with all safety standards. They are equipped with exhaust connections and have a 4-in. adjustment to take care of wheel wear. Hinged covers completely inclose the sides of the wheels, flanges and nuts so that the operator is fully protected. Non-breakable adjustable eye shields as well as chip breakers are also provided over each grinding wheel. The grinding rests are adjustable and can also be removed entirely on such work where they might interfere with the free movement of the operator.

The one-piece spindle is of nickel alloy steel accurately ground to size. The wheel flanges and nuts are machined to be in balance with the spindle to eliminate vibration.

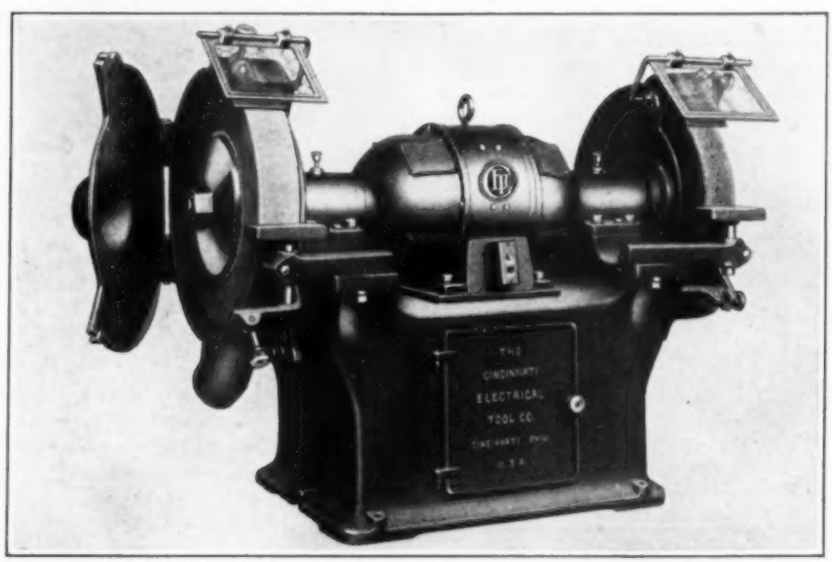
The abrasive wheels for use in connection with the grinders have a 12-in. bore so that the initial cost and replacement of the wheels is low.

The starter is of the safety type, fully inclosed, with both overload and undervoltage protection. It is mounted in the base. A push-button control station is conveniently mounted on the motor frame. These grinders can be had for a.c. circuits of 220, 440 and 550 volts, two or three phase, and for d.c. current of 115 or 230 volts.

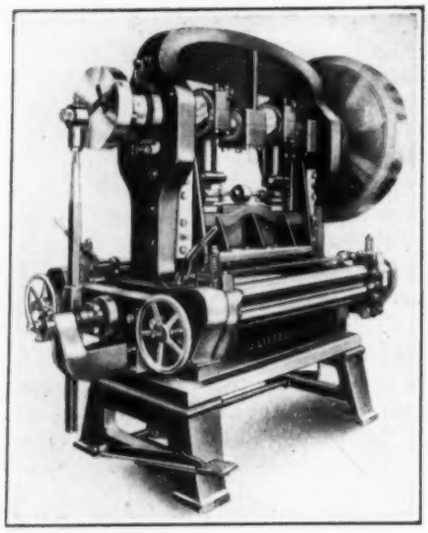
Littell Automatic Punch-Press Feed

An improved type of automatic feed was recently applied by the F. J. Littell Machine Company, Chicago, Ill., to one of their double-crank presses. The feed has a speed and an efficiency that enables it to cut over a million blanks a day when operating at only 75 per cent efficiency. The illustration shows the feed applied to the press.

The feed mechanism is of the double rack and pinion type and takes



Cincinnati Electrical Tool Company Heavy-Duty Floor Grinders



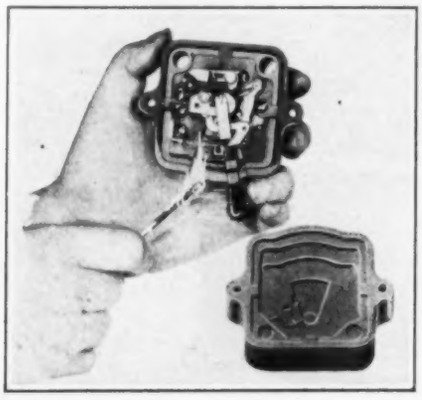
Automatic Feed Applied to a Littell Double-Crank Press

material varying from 0 to 1 in. in thickness. It will feed any kind of material including rubber. In preliminary tests with the press running at 80 r.p.m., 37 blanks were cut in rubber per stroke.

This feed is equipped with double rolls, and has a roller drive handwheel which does not revolve when the feed is running, but which can be used to feed stock forward. The feed also has a hand lifter and an automatic lifter.

Automatic Circuit Breaker for "U. S." Grinders

An improved type of starting switch has been developed for the 7-in. electric grinder made by the United States Electrical Tool Company, Cincinnati, Ohio. It is shown in the accompanying illustration. When the lever is thrown to the "on" position,



Automatic Circuit Breaker for "U. S." Grinders

a small dog holds the current on until overloaded or tripped by hand. The automatic overload device is carefully calibrated, and will trip only within the limits specified by the underwriters.

This switch is quite simple. There are no springs or complicated mechanism to get out of order. It is durable, and well insulated. The casing is made of molded Bakelite and will withstand severe shop usage. The lever is also Bakelite and protects the operator against shocks. The holding screws are concealed so as to prevent tampering without detection.

Ajax-Northrup 3-Kva. High-Frequency Converter and Electric Furnace

In order to provide a high-frequency furnace which would reproduce the same conditions of high-temperature and high-speed uncontaminated melting in small volume, the Ajax Electrothermic Corporation,

Ajax-Northrup 3-Kva. High-Frequency Converter and Electric Furnace

Ajax Park, Trenton, N. J., has constructed the 3-kva. Ajax-Northrup converter and furnace shown in the illustration. This unit is especially suitable for dental alloys, jewelers' work, and research laboratories. It also has uses for production work where small quantities of metals are to be melted, heat-treated or annealed.

A coil with 14 to 16 turns per axial inch is used to carry the high-frequency current. The frequency of oscillation is about 40,000 cycles per second. In this furnace, 9 oz. of Armco iron were melted in 10 min. in a non-conducting crucible, while 9 oz. of electrolytic nickel were melted carbon-free in 9 min. Ten ounces of pure copper were melted by direct induction in 13.5 min. using 2.5 kw. In all these cases the stirring action was very pronounced.

The whole equipment for the 3-kva. furnace is contained in a metal cage approximately 32 in. high. The top of the cage forms a table on which the furnace rests. It weighs about 500 lb. complete and includes the transformer and condensers as standard equipment. The transformer is fitted with external reactance taps and the best reactance for particular conditions can be found by varying these connections.

The unit is particularly adapted for the study of gases in metal and is well suited to handle pieces of metal of a size suitable for carrying on such experiments.

Brightman Bar Turning Machines

The bar turning machine, described on page 556, Vol. 62, of the *American Machinist*, made by the Brightman Brothers Company, Columbus, Ohio, is now being built by the Medart Company, St. Louis, Mo. The latter company has recently purchased all the drawings, patterns and good will of the original builder.

Trade Catalogs

SILENT CHAIN DRIVES. The Morse Chain Co., Ithaca, N. Y., has prepared an attractive catalog on its silent chain drives. The book contains 156 6x9-in. pages and is bound in flexible imitation-leather covers. It has thumb indents for easy reference. The construction of the chain and its theory of operation is first presented, followed by a description of its manufacture. The design of chain drives is then given, after which engineering tables and price lists follow. The latter part of the book is devoted to installations and applications. Numerous photographs are used to indicate how the chain is used in the drive of various types of machines. The illustrations and typographical arrangement are excellent.

NEWS OF THE WEEK

Labor Chief Pleads That Invention Readjust Unemployment

THAT labor-saving machinery, by displacing hand labor or reducing the number of needed machine operators, may have been conducive to the present amount of unemployment, is the view taken by Secretary of Labor Davis in a recent interview. As a result of this alleged condition he now calls upon invention to aid employment.

In substantiating his assertion Mr. Davis says in part: "I am of the opinion that it has added greatly to the situation. One year ago I called attention to this displacement of workers by machinery as something that needed to be watched.

"The sweeping change which had come over the glass industry served to focus thought on the danger. Until a few years ago it was thought that the blowing of glass never would be taken over by machinery. Glass still was blown as it was in ancient Babylon and Egypt. Human skill in glass making was believed irreplaceable.

"Automatic machinery invaded the industry, nevertheless, and provided one of the most striking examples of labor displacement by mechanical devices. In former times 700 men were employed, for instance, in blowing the nation's supply of five-gallon carboys. A single machine operated by a handful of men now fills the supply for the entire country.

"If we are to escape the creation of a class of the chronically unemployed this is a matter that calls for thought. Invention has been speeding up the older industries without developing new ones. My plea has been that our inventive genius should direct itself to the discovery of new human needs and the development of new industries to supply them."

Chicago A.S.M.E. Plans 1928 Machine Shop Practice Meeting

ON MARCH 14 the Chicago Section of the American Society of Mechanical Engineers will hold its annual Machine Shop Practice meeting in the Cameo Room of the Morrison Hotel. Following the practice of former years the meeting will include both afternoon and evening sessions. Several papers dealing with shop management and manufacturing methods will be presented. In view of the diversified program that covers topics pertinent to practically all industries, a record attendance is expected.

Several local societies and organizations have been invited, among them, the Society of Automotive Engineers, the Society of Western Engineers, the Machinery Club, The Illinois Manufacturers Association, and the Chicago Association of Commerce. Frank W. Curtis, western editor of *American Machinist*, will preside.

Starting at 2 p.m., the meeting will be opened by an industrial motion picture. The speakers and their topics listed on the afternoon session are: J. A. Marland, engineer of the W. A. Jones Foundry and Machine Co., Chicago, "Development of Fully-Enclosed Gear Drives for Industrial Speed Reduction"; H. L. Blood, chief of machine design division, Western Electric Co., Chicago, "Special Machinery for Mass Production"; and K. R. Wood, production manager, Bell and Howell Co., Chicago, "Stopping Production Leaks Through a Simplified Production Control."

The evening session includes two papers, one by John P. Kelley, sales manager of the A. O. Smith Corporation, Milwaukee, whose topic will be, "The Production of Pressed-Steel Frames by Automobile Machinery"; and Dr. J. Becker, Ph.D., chief research chemist, of the Vacuum Can Co., Chicago, whose talk will be, "The Relation of Chromium Plating to Industries and the Truth About its Value and Application." Adjournment of the meeting will follow immediately after the presentation of a special motion picture showing the production methods utilized in making the new model "A" Ford car.

Metal Trades Elect New Officers at Meeting

More than 400 members and guests attended the annual meeting and banquet of the Cincinnati branch of the National Metal Trades Association held March 1 and 2, in the Hotel Gibson in that city.

Officers elected were E. A. Muller, president; Charles H. Fox, vice-president; H. A. Felbush, treasurer; George A. Seiler, secretary. Executive Committee: George Schiele, Richard E. Leblond, August Marx.

The program comprised a round-table conference on vital economic problems affecting American industry and was under the chairmanship of Magnus W. Alexander, New York City, and president of the National Industrial Conference Board. A luncheon meeting of the first day in the Hotel Gibson was followed by a discussion of wages and prices, their movement and relationship, by Virgil Jordan chief economist, National Industrial Conference Board; and public expenditures and taxation by William J. Shultz, financial economist, National Industrial Conference Board.

Speakers at the celebration in the grand ball room of the hotel were Hon. Charles Nagel, of St. Louis, who was secretary of commerce and labor in President Taft's Cabinet, "Agricultural Problems and the Approach to Their Solution"; Magnus W. Alexander, "The Paradox of Profitless Prosperity." Friday marked the continuance of the round-table conferences. E. A. Muller, president, Cincinnati branch of National Machine Tool Builders' Association, was the toastmaster.

Metal Workers Score in Non-Accident Contest

At a recent meeting, the Merchants' Association of New York presented awards to the winning contestants in the association's 1927 Metals Manufacturers Industrial Accident Prevention Contest. Fifty metal working companies with plants in the New York City district participated in the contest.

Twenty-two of the contestants went through the entire period of the contest, operating a total of over 800,000 man-hours, without any lost-time accidents, thus winning framed certificates attesting their records. The employees of Stanley & Patterson, Inc., manufacturers of electrical supplies, which company finished in first place, operating its plant of 250 employees for a total of 214,416 man-hours without accident, were awarded $100 in gold in addition to a certificate.

The American Safety Razor Co. (750 employees), which operated for 577,368 man-hours with but two lost-time accidents, and the Sperry Gyroscope Co. (500 employees), which also had but two lost-time accidents in 326,561 man-hours of operation received honorable mention.

During the meeting Lincoln Cromwell, first vice-president of the association, brought out the fact that the loss, in compensated and uncompensated services from industrial accidents in New York exceeded $70,000,000 last year. More than one hundred million dollars additional, it was shown, was lost in machinery costs.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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AS WAS perhaps to be expected in a "presidential" year, business and politics are commencing to impinge upon each other. There are some who deplore this, but it is idle to protest against it for it is inevitable in a democracy where everyone is entitled to vote and nearly everyone is directly or indirectly in business. There is, in fact, some reason to believe that these periodical deraignments of business are salutary in that they enable executives to sense the trend of public opinion and shape their policies accordingly.

Just now two investigations are being held in Washington. One was ordered at the instance of Senator LaFollette and has to do with what have come to be known as brokers' loans. The other relates to the alleged manipulation of the cotton market and is being conducted under the leadership of Senator Smith of South Carolina. Each may have a very important effect upon business. It is too early to say where the investigation of the cotton exchanges may lead to, but the testimony thus far given with regard to brokers' loans has at least made it clear that they will not be increased, and the indications are that some way to reduce them will soon have to be found. This means that the purchase of securities on margin will be greatly restrained and that there will have to be a partial liquidation of the four or five billions of bank credit now employed.

As usual in periods of speculative activity, the public is reluctant to accept conclusions that conflict with its interests or preconceptions. Therefore there has been but little real liquidation in the stock market as yet, and some are saying that brokers' loans will not be reduced because they are but normal in relation to our present wealth. Those who take this view are not, however, very careful students of the past and it might be well for them to review the history of previous booms in the stock market, including particularly what is known as the Harriman boom which was brought to an end because the competition for control of Northern Pacific carried that stock to $1,000 a share.

But it is plain that commerce is not waiting on the stock market, for trade reports indicate that the area of improvement is widening. It is true that car loadings for the week ending Feb. 18 were 7 per cent under last year, but the coal traffic was responsible for most of the decrease and the same statement applies to the railway earnings for January which were about 6½ per cent under those for the same period in 1927.

As it is estimated that the freight on coal is about one fifth of the normal gross earnings of our American railroads the present predicament of the coal industry is of course a matter of very serious concern to both river and rail carriers. It is one of the subjects that Congress is investigating, but no remedy for the overproduction or under consumption has yet been found.

Sugar, rubber and coffee have shared in the upward movement. Sugar seems to have crossed the "Rubicon" and it is rumored that Java has decided to join Cuba in controlling production and exports. It is also suggested that the Dutch and the British may come together in regulating the distribution of rubber, and coffee is somewhat higher because American consumers have had to buy what they needed at the sellers' price.

In the steel industry last week's improvement has been maintained, although it is said that buyers have been made a little more careful by the advance in price, and the automobile manufacturers seem to be undismayed by what the New York *World* describes as a glutted market for used cars. The optimism of the automobile industry is in fact so well organized and regimented that it seems equal to any emergency, and its leaders insist that no concern need be felt for its future. Six companies are said to make 85 per cent of all the cars sold, and their position is greatly strengthened by this concentration.

In Europe as in this country and Canada trade and industry seem to be on the mend, and in London a modest boom appears to be developing in the stock market. The prosperity of France is a surprise to many, and the fear that she may call in the handsome balances that she has to her credit in England and the United States is commencing to haunt the financial leaders in both countries.

In India, China and Russia, (which contain about one half the world's population) there is still great unrest. To the Occidental mind these countries are inscrutable, but they are not for that reason less important to us, for their buying power would be enormous if their standards of living could be advanced by even a little. Here is a field that is worthy of the enterprise of our captains of industry and commerce, and it is commended to their consideration. On the Pacific Coast there are some business men who appreciate its possibilities, but there are opportunities and glory enough to satisfy the ambition of the whole nation.

For while our present economic position seems secure and the outlook for the immediate future is satisfactory, the time will come when our greatest need will be markets for our surplus production and for that need we now should commence to prepare.

WHAT'S DOING IN INDUSTRY

IN MOST industrial centers reported this week, February figures have shown an increase over those of January, and in every case conditions are better than those of a year ago. Inquiries are in evidence everywhere. The most optimistic report comes from Canada. Here the large steel companies are well employed and in one instance double shifts are being used. Automotive production is also active here, particularly in the Ford plant.

WHILE Ford is not up to full production in Detroit, it is expected that he will soon employ a large number of men. Other automotive companies are also busy. Demand from this industry in Indianapolis, however, is below expectations.

WOODWORKING machinery continues active in the South, particularly from furniture manufacturers. Textile machinery is at a standstill, but road-building equipment is being sold in quantity and machine tool business is coming from this source. A similar condition for road-building equipment exists in the Indianapolis territory, where garage and service station equipment is being sold in anticipation of the increased traffic. In Chicago, also, a road machinery firm heads the list of machine-tool buyers.

NEW YORK is spotty, as the present high-level market is sustained largely by a few big orders. The market in New England has been affected to some extent by the sale of one large plant and machines.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CANADA

Machinery and machine tool manufacturers in Canada continue to enjoy a good volume of business, with every prospect of increased activity during the next few months. Reorganization of the British Empire Steel Corporation, and the revival of work in the old Baldwin plant in Toronto, will, it is believed, prove advantageous to the metal-working industry generally. At the moment, the iron and steel industry throughout the country is well employed.

The Dominion Iron and Steel Co. has commenced rolling an order of 12,000 tons of rails for the Michigan Central Railroad. All of the plants of the Steel Co. of Canada are reported active. The Algoma Steel Corporation had $7,000,000 of unfilled orders on its books on Feb. 16, which was $5,000,000 more than two years ago. The plant is running on double shift.

An exceedingly bright spot is the demand for building equipment and machinery. Orders have been unusually heavy since the beginning of the year and sales have been well distributed throughout the country. Building permits issued during January totaled in value $7,708,904, as compared with $5,676,535 in January, 1927, an increase of 35.8 per cent.

Conditions in the automotive industry are gradually improving, and a busy season is anticipated. Questioned recently concerning production in the Canadian plants of the Ford Motor Co., W. R. Campbell, vice-president and treasurer, said: "Our previous daily figure of 500 cars a day will soon be reached, and by March deliveries will be made to the public in strict rotation."

The plant of the Aluminum Co. of Canada, Ltd., at Arvida, Quebec, is reported to be operating at full capacity. An official of the company recently stated that he expected to see a considerable improvement in the tonnage consumed during 1928.

CINCINNATI

A slightly increased demand in the past week is reported by the majority of the machine tool manufacturers in the Cincinnati district—not large, but enough to be encouraging. No manufacturer reported a smaller volume of business than in the previous week, and therefore the trade, taking it as a whole, made some gain.

Sales agents report that although the market was dull, in their respective territories, during the past week, they did a little better than to hold heir own. Plenty of business is pending, it is stated, and it is thought by this branch of the trade that sales are about to show an increase.

While the week's business showed at least some increase in sales, no large orders were reported, the bookings being almost entirely confined to single tools and replacements. The orders received were well scattered over the country and the purchases were well diversified in the matters of types and sizes of tools. The principal buyers were miscellaneous users and general machinists, the purchases of railroad and concerns in the automotive industry being very limited.

The entire trade reports that inquiries came in freely during the past week, from all sections of the country and from practically all classes of users, but by far the greater part being from general machinists and miscellaneous small users. The great majority of the inquiries were for single tools, but here and there was one for two or three pieces of equipment. A large percentage of the prospective buyers, it seems, have in mind the purchase of efficient tools to replace obsolete equipment.

NEW YORK

Although most of the machine tool dealers handling well diversified lines consider that February was a good month, and in some instances better than January, conditions in the metropolitan market may be said to be spotty, in that not everyone shared in what orders were placed. Definite trends are hard to trace since conditions for one company may be exactly reversed for another. One dealer stated that his sales had been well diversified and that many small orders had been placed, leading him to believe that a general increase in production was in evidence; another found most of his business in a few large orders from large plants only, particularly in the past week, when sales were above average. In another instance, the statement was made that many plants in New Jersey were inactive, while another statement was to the effect that the biggest sales were in that state.

There is this much to say for New Jersey: the Wright Aeronautical Corporation has been buying steadily in the past few weeks, including several types of millers and drills, both radial and upright. Edison has also been a buyer, as well as International Motor Co. Another aeronautical motor company is also about to get into production in central New Jersey and some business is expected there in machine tools.

Railroads are beginning to resume activities. A sizeable list was recently closed by the D., L. & W., the equipment being for the Scranton shops. The New York Central, which, so far as is known has placed no orders this year, is reopening old lists and beginning to show other signs of activity.

Inquiries seem to be plentiful, and there are several mysterious references, but no information, about some large orders pending. In general, there is optimism that conditions will remain steady during the coming few months, which is to say fair for the industry as a whole.

Companies that sell outside New York list as buyers: Morgan Construction Co., Worcester; Brown & Sharpe Manufacturing Co., Providence; Vulcan Tool Co., Dayton; Packard Motor Car Co., Detroit; General Electric Co., Pittsfield and Schenectady; Bullard Machine Tool Co., Bridgeport; N. Y., N. H. & H. R.R., and City of Hagerstown. The last two were purchasers of 10-ton cranes.

CHICAGO

Business in machine tools for the month of February is reported by the trade as having shown a distinct improvement over January. The increase in activity is attributed to the speeding up of general industry throughout the Middle West, no specialized line being a predominating factor in the matter of demand. It had been thought that Western railroads would have made their 1928 machine tool requirements known before this, but up to the present the Santa Fe is the only road to have submitted lists, and on these closing is deferred.

Inquiries continue to be received in encouraging volume from varied sources. Several Milwaukee concerns are in the market for both new and used tools, the T. L. Smith Co., a road machinery house, leading with a list totaling about $40,000. Farm machinery and farm tractor manufacturers are reported to be preparing lists for early closing. The International Harvester Co., and the Deere Co. of Moline have been doing some buying of needed equipment, and are said to be preparing to make additional requirements known shortly.

Dealers specializing in used tools are doing more business than for the last several months, and report better prices as generally prevailing.

NEW ENGLAND

Lagging industries advanced substantially during February, and business as a whole rides into March at a more satisfactory level with conditions better balanced. Results in the machinery and machine tool field during February showed improvement over January in the New England section.

Machinery of the Jewell Belting Co., Hartford, comprising 336 items, drew 150 bidders, and was disposed of for $25,000, during the past week. The Stanley Works, New Britain; Hartford Electric Machinery Co., Hartford; Woburn Machine Co., Woburn, Mass., and several leather companies were represented among the buyers. Four leather stretching units (Horsting), original cost $44,000, were sold for $7,500.

The Max Ams Co., Bridgeport, is building the machinery and engineering the construction of a rayon plant at Burlington, N. C., for A. M. Johnson of Chicago, Machine tool orders placed with Connecticut builders during the current week include profiling machine, jig borer, shaper, die-sinking machine and 14-in. lathe.

SOUTHERN DISTRICT

Judging from reports by Atlanta distributors machinery, machine tool and equipment sales have been somewhat better so far this year than had been expected. The past two weeks has witnessed another slight gain in the sales volume, while the volume of inquiries and their general tone, and reports from sales representatives in the field, seem to give promise of still further betterment.

As has been the case for some time past, the primary demand is for woodworking machinery, sales of such equipment continuing very active in the Carolina, East Tennessee and Georgia territory, and fairly brisk elsewhere in the Southeast, total volume being well above the corresponding period in 1927.

Most of this business is in the furniture field, but activity also is reported in the millwork, planing mill and sawmill fields. Brick machinery is showing a slight improvement, but sales are not as active as last season. Road building machinery and contractors' equipment are unusually good, especially the former, and promise to continue active to at least the middle of spring.

Railroads also are buying actively in the heavier equipment field, and sizeable orders for rolling stock and rail tonnage also have been recently reported by larger systems operating in this district. On the other hand, textile mill sales are quiet and ex-

pected to continue so for most of the year, while there is little demand in the garage field or from the smaller machine shops, the last two buying hardly anything save used equipment at this time.

As a whole, sales compare more favorably, with those up to this time last year, than distributors in this district had expected early in 1928.

INDIANAPOLIS

A slight gain continues to feature the machine tool and machinery business here. The gain is not so great during the last half of February as it was during the first half, but the situation is much improved over the same time a year ago and the trade is rather less pessimistic. Sales seem to be scattered over a rather wide area with some spottiness in the demand, some industries being very slow with orders and others rather more active than was expected.

The present indications call for a considerable amount of road building machinery to be sold this year. The state highway commission and the various counties now are advertising their first spring work and contractors are looking with more than usual care on their machine equipment. It is believed that a large amount of replacement machinery will be necessary, since a comparatively small volume has been purchased since the first rush for good roads following the war.

Also the inquiries show a tendency for other construction equipment. Inquiries are being received in a larger volume for garage equipment, grinders and small lathes, chain hoists and other similar equipment being wanted. Some demand is coming from service stations and this business should be good also. Demand from the automobile industry is yet rather smaller than many of the dealers prepared for. Some small purchases are being made, but the industry is proceeding carefully in this line.

DETROIT

The machinery and machine tool business in the Detroit district still is improving but, in some respects, with a little less regularity than marked its advance two weeks ago. Orders for equipment of all kinds and inquiries still are coming in but for the past few days some of the dealers have noted a slight falling off in the volume.

The machinery being purchased here this week is miscellaneous in character and covers almost the entire field of automotive requirement. And nearly all of the dealers are fairly busy. Many of them report that orders are far ahead of delivery and that it will be, apparently, a long time before immediate delivery can be promised on orders.

February was evidently a little more prosperous than January which was the best month seen in this district for more than a year. And from all appearances March will surpass February by a good margin.

Studebaker, Dodge, Chevrolet and Graham-Paige are still going ahead in sales and production. Ford has not yet gone into real production but indications are that he will very soon get under way and employ an unprecedented number of men.

The small shops are fairly busy. Some of them have orders for all sorts of tool room work and nearly all of them are doing something. Employment still is advancing at a fairly rapid rate.

Welding Classes Revised

A school of welding, although, for many years in existence in the shops of the Lincoln Electric Company, Cleveland, Ohio, has been entirely reorganized and re-equipped. Its purpose is the training of electric arc welders. No tuition fee is enacted.

A number of standard 200-ampere welders have been installed in line with a series of booths in which the pupils do their work. The new arrangement has been developed in order to simplify as much as possible, the student's work in familiarizing himself with welding machines and practice. The individual compartments are curtained by heavy materials so that there may be no chance of the arcs, struck by other pupils, "flashing" the men's eyes.

The course extends over a period of 30 days and is given in twelve lessons.

Personals

P. R. HOOPES, consulting mechanical engineer, of Hartford, Conn., is spending a few weeks in Germany on business.

M. T. CLARK, C. D. Loveland and C. I. Auten, have been elected directors of the Truscon Steel Co., Youngstown, Ohio.

M. H. BERTENSGAW has been placed in charge of the newly opened branch office of the Beall Pipe & Tank Corporation, Portland, Ore.

A. J. BRANDT, former vice-president in charge of operations at the Oakland Motor Car Co., Pontiac, will leave to become co-ordinating executive of the Autocar Co., truck manufacturers of Ardmore, Pa. He will have charge of all manufacturing operations.

V. A. GREENE has been elected vice-president and general manager of the Edgar Allen Steel Co., Inc., of Chicago, succeeding George R. Bennett, resigned. Mr. Greene for the past twelve years has been eastern manager for the company with headquarters in New York.

EDWARD H. INGRAM has been appointed general superintendent and works manager of the Automatic Nut-Thread Corporation, Philadelphia. Mr. Ingram formerly was with the Landis Tool Co., Waynesboro, Pa.

DR. CORNELIUS LELY, president and honorary member of the Netherlands Royal Institute of Engineers and a member of the Royal Academy of Sciences, was honored at a luncheon given by the Engineers' Club, on March 6. The event was under the auspices of the united societies of civil, mining, metallurgical, mechanical and electrical engineers of the United States.

LORIMER DUNLEVY has resigned as sales manager for the Climax Engineering Co. of Clinton, Iowa, effective March 15, to take on new duties as general sales manager for the O. E. Szekely Co. of Holland, Mich., makers of commercial airplane engines and other products now in process of design.

W. F. GLASER, has been appointed district sales manager of the Louis Allis Co., direct and alternating current motors, Milwaukee, Wis., in its Cleveland district and is located in the Union Building, 1836 Euclid Ave. Mr. Glaser is a graduate engineer and a man of broad experience in the application of motors and controls.

D. S. ROBINSON has been elected president of the Northwest Furnace Builders, an association of furnace manufacturers of Washington and Oregon. W. H. Carston, Majestic Furnace & Manufacturing Co., Seattle, was elected vice-president and Floyd Oles, of the Manufacturers' Assn. of Washington, secretary-treasurer.

SAMUEL HARDEN CHURCH, vice-president and director of the Union Steel Castings Co., Pittsburgh, has resigned as vice-president and secretary of the Pennsylvania Railroad, eastern lines, being retired from active service under the pension regulations. He celebrated his seventieth birthday Jan. 24, after having spent 52 years in railroad work.

MYRON F. WESTOVER, secretary of the General Electric Co. for the past 34 years, retired on March 1 and William W. Trench, assistant secretary, has been elected by the board of directors to succeed him. Mr. Westover has been actively identified with the electrical industry for 40 years, his first position being secretary to the late Charles A. Coffin, then treasurer and manager of the Thomson-Houston Electric Co.

RALPH ROLLINS, formerly identified with the sales offices of the Easton Car Construction Co., Easton, Pa., has been appointed manager of a southeastern branch recently established by the George D. Whitcomb Co., Rochelle, Ill., manufacturer of industrial locomotives, at 1206 Commercial Bldg., Charlotte, N. C., to handle the company's sales in the North and South Carolina and a part of the Virginia territory.

LEON BRILLOUIN of the faculty of the College de France, Paris, has been appointed acting professor of theoretical physics for the second semester at the University of Wisconsin, Madison, Wis. He is recognized as one of the ablest and most widely known of the younger French physicists and was a delegate to the International Mathematical Congress in Toronto in 1924.

WILLIAM B. UPDEGRAFF, at a recent meeting of the board of directors, was elected vice-president in charge of sales of the Watson-Stillman Co. For the last fifteen years Mr. Updegraff has been engaged in various engineering and sales capacities with this company. He is a member of the American Society of Mechanical Engineers, the Harvard Club of New York, and the Machinery Club of New York.

W. W. NICHOLS, vice-president and mechanical engineer of D. P. Brown and Co., 1440 Park Pl., Detroit, has recently been highly honored by having conferred upon him membership in the Masaryk Acadamy of Work of Prague, Czechoslovakia. This makes the second membership in foreign engineering societies to have recently been conferred upon Mr. Nichols. He previously had been admitted to membership in the Institute of Scientific Management of Warsaw, Poland.

WARREN B. FLANDERS, assistant manager of engineering at the South Philadelphia works of the Westinghouse Electric & Manufacturing Co. has recently been commissioned a lieutenant-commander in the U. S. Navy Reserve for special engineering duty. Mr. Flanders was born in 1880 and was educated at Cornell University. After graduation in 1902 he joined the Westinghouse Machine Co. at East Pittsburgh, Pa. He spent ten years with this company on steam work obtaining considerable experience in the shops and field, and was later connected with the engineering department.

S. T. JOHNSTON, vice-president and general manager of the S. Obermayer Co., Chicago, has been nominated for president of the American Foundrymen's Association. Fred Erb, president of the Erb-Joyce Foundry Co., Detroit, has been nominated for vice-president of the association. Directors nominated are S. W. Utley, vice-president, Detroit Steel Castings Co., Detroit; L. W. Olsen, works manager, Ohio Brass Co., Mansfield, Ohio; B. H. Johnson, works manager, Cresson-Morris Co., Philadelphia; Peter J. Krentz, vice-president and works manager, Buffalo Foundry & Machine Co., Buffalo; C. E. Hoyt, executive secretary American Foundrymen's Association.

Business Items

The General Piston Ring Co. of Indianapolis, has filed an affidavit with the secretary of state in Indianapolis changing its place of business to Tipton, Ind.

The Harmony Foundry Co., 1200 North Illinois St., Belleville, Illinois, has been incorporated to manufacture and deal in gray iron castings, stoves, machine castings, etc.

Letters of incorporation have been granted to Central States Machinery Co., 134 S. Clinton St., Chicago. The company will deal in machinery, machine products, iron, steel and other metals.

The National Grave Vault Co., and Galion All Steel Vault Co., both of Galion, Ohio, have been sold to eastern capitalists. C. L. Stiefel, president and general manager, will remain with the new organization in the same offices.

Articles of incorporation have been filed with the secretary of state in Indianapolis by the Hammond Bolt & Nut Co. of Hammond, Ind. The corporation has an initial capital stock of $500,000. The incorporators are Charles Aaron, Franklin Raber and Charles E. Clark.

The Allis-Chalmers Mfg. Co. announces the purchase of the Monarch Tractor Corporation of Springfield, Ill., manufacturers of

crawler or tank type tractors. The Monarch organization has developed a complete line of crawler tractors and holds lincense arrangements for the manufacture of this type.

The T. B. Reid Machinery Co., Toronto, has been appointed agents for the Kent Machine Co., Kent, Ohio, manufacturers of the Kent cap screw pointing and shaving machine for automatically pointing the ends and shaving the heads of upset cap screws, bolts and similar products.

The Georgia State Highway Department, Atlanta, announces the awarding of contracts recently for road building machinery and equipment amounting to approximately $160,000, for road construction and maintenance work in the state during the present year. Orders were placed on a competitive bid basis and went to several companies.

Directors of the Stanley Works, New Britain, Conn., at their annual meeting, authorized a dividend of 22½ per cent on the common stock payable April 1 to stockholders of record of March 17; also a dividend of 1¾ per cent on the preferred stock, payable May 15 to stock of record of May 5. Further it was voted by stockholders to authorize the sale of the company's branch plant at Bridgewater, Mass. Surplus of the company as of Dec. 31, 1927, was $4,113,862.04. Net earning after deduction of federal taxes for 1927 amounted to $1,466,942.45. Officers and directors were re-elected.

The Walcott Mfg. Co., 80 Pliny St., Hartford, Conn., and the Beardsley Mfg. Co., Waterbury, Conn., each manufacturers of electric specialties, have consolidated under the name of the Beardsley-Wolcott Manufacturing Co. The plants are at Hartford and Waterbury, Conn., but it is expected eventually to concentrate operations at Waterbury. C. E. Beardsley is president, and Frank E. Wolcott, vice-president. Mr. Wolcott also is president of the Appliance Mfg. Co., the Hartford-Sterling Co., Lansdowne, Pa., and the Silex Co., Malden, Mass.

The Supreme Court of Nova Scotia has ordered that all proceedings in relation to the winding up of the Dominion Steel Corporation be permanently stayed and that the operation of the order be suspended until the appeal to the Privy Council in the matter has been wholly withdrawn. This action follows the agreement recently reached between the National Trust Co., receivers and managers of the Dominion Iron and Steel Co., Ltd., who initiated the action, and the Holt, Gundy interests who have acquired the holdings of the British Empire Steel Corporation.

Obituaries

HENRY PHELPS HOWLAND, blast furnace superintendent for the Wisconsin Steel Co., South Chicago, Ill., is dead.

GEORGE J. SHEPPARD, Montreal, former vice-president and manager of the Canadian Pneumatic Tool Co., is dead after an illness of two months.

JAMES B. BAKER, president and general manager of the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is dead. He was 75 years of age.

WILLIAM CROUSE, vice-president Crouse & Pope Foundry Corporation, Auburn, N. Y., died recently in that city. He organized the Crouse & Pope Corporation in 1919, with plant and offices at Weedsport, N. Y.

ARTHUR SCHOLZ, 36 years old, for ten years a teacher of machine shop practice in the Bronx Continuation School, is dead of appendicitis. He is survived by his widow.

HERBERT L. HART, manager of the bolt and rivet department of the Inland Steel Co., Chicago, died recently at his home in that city. He was born in Chicago in 1866, and became affiliated with the Inland company in 1910.

SAMUEL N. CRAIG, 42 years of age, president of the Treadwell Construction Co., and the Midland Barge Co., Midland, Pa., recently was killed in an airplane accident at Aurora, Neb. He was on his way to Los Angeles, and missing a train connection, he chartered the airplane to avoid loss of time.

GEORGE POOLE, inventor of textile machinery, is dead at the age of 83. His inventions made possible much of the textile machinery used in New England plants. Among his principal inventions was a device to stop a loom the instant a thread broke. He was born in England and came to this country in 1870.

FRANK A. TYLER, president and treasurer of the J. C. Metcalf Machine Co., Boston, Mass., died recently at his home, in Lynn, Mass., in his fifty-ninth year. Mr. Tyler was a native of Salem, Mass., and formerly was connected with the Lynn Box Co., and had headed the J. C. Metcalf Machine Co. for the past ten years.

ROY N. COLE, secretary and treasurer of the R. D. Cole manufacturing Co., Newnan, Ga., manufacturers of machinery, mill supplies, machinery parts, etc., died unexpectedly a few days ago at his winter home at St. Petersburg, Fla., at the age of 61 years. Mr. Cole had been identified with the machinery manufacturing and metal trades industries in the Southeast for many years, and associated with his brother, R. D. Cole, in the Newnan concern for several years.

ORLANDO J. ROOT, a pioneer in American automotive industrial circles, associated with the Root & VanderVoort Co., makers of the R & V Knight and during the war munitions contractors, is dead as the result of an accidental bullet wound. He was 58 years old.

Mr. Root attended the Michigan State Agricultural College at Lansing. While there he met William G. VanderVoort with whom he established the Root & VanderVoort Co., in Champaign, Ill., manufacturing gas engines. In 1899 the plant moved to East Moline and the firm began manufacture of automobiles.

Calendar of Local Meetings

National Association of Cost Accountants

Baltimore Chapter. April 17. Subject: "The Budget in Manufacturing—Application of Budgetary Principles and Their Performance."

Boston Chapter. April 26. Subject: "Cost and General Accounting Procedure for a Paper Mill," by Homer A. Sargent.

Buffalo Chapter. April 26. Hotel Buffalo. Subject: "Debatable Questions in Industrial Accounting." By Clarence S. Marsh.

Cincinnati Chapter. April 17. Subject: "Accounting for Value of Fixed Assets," by H. G. Baldwin.

Chicago Chapter. April 19. Subject: "What the Sales Department Wants From the Accountant," by V. Frank Banta.

Society of Automotive Engineers

Cleveland Chapter. March 12. Subject: "The Importance of Mechanical Inventions," by F. O. Richey.

Pennsylvania Chapter. March 13. Subject: "Alloy Steels as Applied to the Automotive Industry," by Dr. B. Egeberg.

American Society of Mechanical Engineers

Metropolitan Section. March 14. Subject: "The Mechanical Engineer in the Railroad and Railroad Supply Industry," by Eliot Sumner. Presentation of awards for the best paper submitted in the Student Associate competition, by J. O. G. Gibbons.

Toledo Section. March 2?. Subject: "Steel as Specified and Tested for Use in Airplanes," by J. L. McCloud.

Worcester Section. March 8. In the afternoon there will be an inspection trip through the factory of the Graton & Knight Manufacturing Co.

Forthcoming Meetings

Southern Supply & Machinery Dealers' Association. Will meet in annual convention in Nashville, Tenn., May 15, 16 and 17 jointly with the **National Supply & Distributors' Association** and the **American Supply & Machinery Manufacturers' Association.**

National Safety Council. Mid-West Safety Conference, Chicago, March 19. A. A. Mowbray, director of publicity, 108 E. Ohio St., Chicago.

American Gear Manufacturers' Association. Twelfth annual meeting, Rochester, N. Y., April 19, 20 and 21, Hotel Seneca. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Welding Society. Annual meeting, week of April 23, New York City. M. M. Kelly, secretary, 33 West 39th Street, New York City.

American Railway Association. Schedule of sectional meetings: Division IV, Engineering, March 6 to 8, Chicago; Division V, Mechanical, June 13 to 20, Atlantic City, N. J.; Division VI, Purchases and Stores, June 13 to 15, Atlantic City, N. J. Division VI, Electrical, Sept. 22 to 28, Cleveland, Ohio. J. W. Welsh, secretary, 292 Madison Avenue, New York City.

National Metal Trades Association. Thirtieth annual meeting, Hotel Astor, New York, April 25 and 26. J. E. Nyham, secretary, Peoples Gas Bldg., Chicago, Ill.

National Foreign Trade Council. Fifteenth anniversary convention, Houston, Texas, April 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

American Foundrymen's Association. Convention and Exhibit, Philadelphia, May 14 to 18. Technical Sessions at Hotel Belleview-Stratford; exhibit at Commercial Museum. R. E. Kennedy, secretary, 140 So. Dearborn St., Chicago.

National Association of Purchasing Agents. Annual meeting and "Informashow," Kansas City, Mo., May 28 to 31. W. L. Chandler, secretary, 11 Park Place, New York.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

METAL products, except tin alloys, hold a stronger price position than a week ago, in the principal markets. Present heavy supplies of non-ferrous metals will serve to prevent price recovery in that group. Steel structurals appear to be holding the price advance of a week ago, largely because of increasing construction demand. Cast-iron and wrought-steel pipe follow steel shapes in construction requirements. Sheet demand is slow with the exception of automotive material. Railways are taking car material and track supplies in substantial quantities. Tin plate continues in fair demand with prices stable. Leather belting price trend is upward owing to comparatively limited supplies.

(All prices as of March 2)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.50	3.25	3.89
No. 12	2.15@2.25	3.55	3.30	3.94
No. 14	2.20@2.30	3.60	3.35	3.99
No. 16	2.30@2.40	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.35	4.20	4.00	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.90	4.25
Nos. 12 to 14	3.05@3.15	4.20	4.00	4.35
No. 16	3.15@3.25	4.30	4.10	4.45
No. 18	3.30@3.40	4.45	4.25	4.60
No. 20	3.45@3.55	4.60	4.45	4.75
No. 22	3.50@3.60	4.65	4.50	4.80
No. 24	3.65@3.75	4.80	4.60	4.95
No. 26	3.90@4.00	5.05	4.85	5.20
No. 28	4.15@4.25	5.30	5.10	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt-welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard, sizes 36–5% off.

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness Decimal	Thickness B.w.g. and Fractions	Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	5.70	6.10
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex	3.40	3.65	3.60
Cold drawn, flats and squares	3.90	4.15	4.10
Structural shapes	3.34	3.00	3.10
Soft steel bars	3.24	3.00	3.00
Soft steel bar shapes	3.24	3.00	3.00
Soft steel bands	3.99	3.65	3.65
Tank plates	3.34	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½ 7.35c. per lb. *Flat, 1/16@½-in. thick.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots.

Copper, electrolytic, up to carlots, New York			15.00
Tin, pigs, 5-ton lots, New York			54@55
Lead, pigs, up to carlots, E. St. Louis 5.75	New York 7.50–8.50		
Zinc, slabs, up to carlots, E. St. Louis 5.45	New York 7.00–7.50		

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	12.75–13.25	13.25	14.25
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	19.37½	19.37½	16@16¼*
Copper bars, base	22.25	22.25	22.25
Copper tubing, base	24.50	24.50	24.50
Brass sheets, high, base	18.75	18.75	18.75
Brass tubing, high, base	23.62½	23.62½	23.62½
Brass rods, high, base	16.50	16.50	16.50
Brass wire, high, base	19.25	19.50	19.25

*Mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	27@28	22½@24	24.03
Zinc sheets (casks)	10@10½	12.65	10.36
Solder (½ and ½), (case lots)	33.50	35.50	33@37
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			69.00
Commercial genuine, intermediate grade			60.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	12.12½@12.37½	11.50	11.00@11.50
Copper, heavy, and wire	11.50 @12.12½	10.75	10.50@11.00
Copper, light, and bottoms	10.25 @10.75	9.50	9.25@ 9.75
Heavy lead	4.75 @ 5.00	5.25	4.50@ 5.00
Tea lead	3.75 @ 4.00	3.75	3.50@ 4.00
Brass, heavy, yellow	7.12½@ 7.37½	7.25	7.00@ 7.50
Brass, heavy, red	9.00 @ 9.50	9.75	9.00@ 9.25
Brass, light	5.50 @ 5.75	5.75	6.00@ 6.50
No. 1 yellow rod turnings	7.25 @ 7.75	7.50	7.00@ 7.50
Zinc	3.25 @ 4.00	3.25	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.10	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.17@.17½	38.00 per M	.15
Sal soda, per lb	.02	.02	.02¾
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.76½	.84	.78
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.27	.36	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.			
Medium grade	35%	35%	35%
Heavy grade	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade	45%	50–10%	50%*
Second grade	50%	60–5%	50–10%†

*Large quantities, 60%. †Large quantities, 60–10%.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.034	.033	.04
Brass rods	per lb.	.165	.165	.1587½
Solder (½ and ½)	per lb.	.335	.35	.4012½
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6-in. dia	per 100	3.10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	.27	.27	.33
Belting, leather, medium	off list	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.40	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.65@3.00
Coke, prompt foundry, per net ton	Connellsville,		3.75@4.50
White lead, dry or in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1⅛ and 1¼ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia.	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

D. C., Washington—Bureau of Supplies & Accounts, Navy Dept., will receive bids until Mar. 15 for band saws and electric drills and grinders at Navy Yard, Boston, Mass.

D. C., Washington—A. L. Flint, General Purchasing Officer of the Panama Canal—will receive bids until Mar. 20 for one pipe threading machine, two column shapers, etc.

Ill., Chicago—Dept. of Public Works, R. W. Wolfe, Comr., will receive bids until Mar. 12 for a 10 ton hand operated traveling crane complete with accessories for Thomas Jefferson pumping station, 2250 Eastern Ave.

Mass., Malden (Boston P. O.)—Valprey Press,, 65 Clinton St.—screw cutting engine lathe, 16 in. swing, 36 in. bed, hollow spindle, compound rest chuck.

Mass., Watertown (Boston P. O.)—T. R. Harlow, 27 Franklin St.—engine lathe, 6 ft. x 15 in. and jointer, about 12 in. head.

Mich., Ann Arbor—King Seeley Co., 294 Second St.—machinery and equipment for the manufacture of small metal parts for gasoline gages. Estimated cost of proposed factory $85,000.

Mich., Detroit—Chevolet Motor Car Co., 1840 Holbrook Ave.—machinery and equipment for proposed 1 story, 80 x 400 ft. forge shop.

Mich., Detroit—Manufacturers Steel Supply Co., 2162 Clay Ave.—power press for general purpose.

O., Niles — The Stevens Metal Products Co.—two horn presses, depth of throat not less than 18 in. or more than 24 in.

O., Steubenville — Wheeling Steel Corp., Wheeling, W. Va.—two 200 ton cranes for plant here.

Okla., Tulsa—P. O. Box 1694—one open throat type power punch.

Tex., Dallas—John E. Mitchell Co., 600 South 6th St., St. Louis, Mo.—machinery and equipment for the manufacture of parts for cotton gin machinery for proposed plant here. Estimated cost $100,000.

Tex., Tyler—St. Louis Southwestern Ry. Co., H. O. Devine, Asst. Purch. Agt., St. Louis, Mo.—machinery and equipment including cranes, etc. to cost $90,000 for proposed extensions and improvements to shop.

Opportunities for Future Business

Calif., Berkeley—Bunting Iron Works, 820 Parker Ave., awarded contract for a 1 and 2 story plant. Estimated cost $42,320. Noted Feb. 23.

Conn., New Haven—Koppers Co., Waterfront St., awarded contract for a 1 and 2 story, 98 x 124 ft. by-products plant. Estimated cost $100,000.

Conn., Thomaston—Seth Thomas Clock Co., Elm St., will receive bids until Mar. 10 for a 4 story, 60 x 100 ft. factory. Estimated cost $125,000. Lockwood Greene & Co. Inc., 24 Federal St., Boston, Mass., Archts.

Del., New Castle—Bellanca Aircraft Inc., will receive bids until Mar. 10 for the construction of a 135 x 190 ft. factory including auxiliary shops, etc. Estimated cost $100,000.

Ga., Atlanta—The Atlanta Textile Supply Co., Austell Bldg., distributors of equipment for cotton manufacturing plants, having plans prepared for a new plant on Glenn St. Estimated cost $35,000.

Ill., Chicago — C. B. Isett & Son, 1701 Winnebago Ave., manufacturers of boilers and tanks, plans the construction of a 1 story, 50 x 125 ft. plant at Rockwell and 26th Sts. A. E. Stobel, 192 North Clark St., Archt.

Ill., Chicago—Reliance Die & Stamping Co., P. J. Jacobsen, Pres., 501 North La Salle St., awarded general contract for a 3 story, 88 x 257 ft. machine shop on Clybourn St. Estimated cost $200,000.

Ill., Flora—F. Kuehne, Jr., Trenton, is having preliminary plans prepared for a 1 story, 60 x 600 ft. furniture factory. Estimated cost $40,000.

Ill., Quincy—Excelsior Stove & Mfg. Co., J. Fisher, Pres., plans to rebuild factory to include foundry, etc. partially destroyed by fire. Behrensmeyer & Hafner, Archts.

Ill., Rockford—Rockford Drop Forge Co., E. S. Ekstrom, Pres., 9th and 20th Ave., awarded contract for a 100 x 155 ft. addition to plant at 2031 Ninth St.

Mass., Boston—Edison Electric Illuminating Co., 39 Boylston St., awarded contract for a 1 story garage and repair shop on Massachusetts Ave. Estimated cost $60,000. Noted Jan. 26.

Mass., Pittsfield—General Electric Co., C. C. Chesney, Gen. Mgr., had plans prepared for a 2 story, 40 x 280 ft. molding insulation mixing plant on Silver Lake. Estimated cost $40,000. J. Trainor, c/o owner, Archt.

Mass., South Boston (Boston P. O.)—New England Metal Culvert Co., Tennyville St., Palmer, is having plans prepared for a 1 story, 80 x 85 ft. factory at 10 Alger St. Monks & Johnson, 99 Chauncy St., Boston, Engrs.

Mass., Springfield—New Bridge Garage, 1725 Columbus Ave., awarded contract for a 2 story, 70 x 100 ft. addition to repair and service garage on Columbus Ave. Estimated cost $50,000.

Mich., Detroit — Smith, Hinchman & Grylls, 800 Marquette Bldg., Archts., are receiving bids for a 6 story, 25 x 70 ft. addition to auto body plant for Chrysler Motor Corp., 12265 East Jefferson Ave. Estimated cost $125,000.

Mich., Detroit—Koestlin Tool & Die Co., 3601 Humbolt St., awarded contract for a 1 story, 90 x 165 ft. tool and die shop. Estimated cost $50,000.

Mo., Anglum—Curtiss-Robertson Airplane Mfg. Co., St. Louis Flying Field, Bridgeton, awarded contract for a 60 x 250 ft. factory including 40 x 60 ft. woodworking shop and storage building, 40 x 60 ft. paint shop, etc. here. Estimated cost $65,000. Noted Feb. 16.

Mo., Anglum—B. F. Mahoney Co., San Diego, Calif., awarded contract for the construction of an airplane factory including 40 x 60 ft. paint shop, etc. here. Estimated cost $50,000. Noted Feb. 16.

Mo., St. Louis—Associated Motors Terminal Co., c/o W. King & Associates, 117 South Broadway, will soon receive bids for a 6 story, 80 x 100 ft. garage at 7th and Morgan Sts. Estimated cost $300,000. Gill & Jackson, 520 Buder Bldg., Archts. W. J. Knight & Co., 901 Wainwright Bldg., Engrs.

N. J., Haskell—Transogram Co. Inc., will soon receive bids for a 1 story, 98 x 400 ft. factory. Estimated cost $100,000. O. Goldschlag Inc., 1482 Broadway, New York, N. Y., Archt. and Engr.

N. J., Newark—Meeker Holding Co., 1060 Broad St., will not construct 2 story, 100 x 100 and 50 x 150 ft. garage at 403 Elizabeth Ave. Estimated cost $150,000. Project abandoned. Noted Jan. 26.

N. Y., Brooklyn—P. Bussi, 1447 78th St., is having plans prepared for a 2 story, 93 x 156 ft. garage and service station at New Utrecht Ave. and 62nd St. Estimated cost $55,000. S. A. Minoli, 110 West 40th St., New York, Archt.

N. Y., Brooklyn—J. J. Hart, 1029 Atlantic Ave., had plans prepared for a 164 x 181 ft. garage and service station at Atlantic Ave. and Union St. Estimated cost $60,000. M. Klein, 65 Court St., Archt.

N. Y., Brooklyn—D. Welsch, 20-46 Hewes St., is receiving bids for a 1 story garage at 43-47 Emerson Ave. Estimated cost $60,000. H. J. Nurick, 44 Court St., Archt.

N. Y., New Rochelle — New Rochelle Water Co., 514 Main St., awarded contract for a 2 story garage and office on Cottage Pl. Estimated cost $100,000.

N. Y., New York—J. Barsky, 530 East 5th St., Brooklyn, awarded contract for a 2 story garage at 52 Greenwich St., here. Estimated cost $75,000.

N. Y., New York—I. Ehrman, 41 Park Row, awarded contract for a 2 story garage. Estimated cost $75,000.

N. Y., New York—Henry Fuldner & Sons Inc., 404 East 4th St., manufacturers of furniture, plans the construction of a factory. Estimated cost $500,000. Architect not selected.

N. Y., Woodside—Feranda & Flaschner, 43-26 52nd St., is receiving bids for a 2 story garage at Hancock Pl. and Queens Blvd. Estimated cost $45,000. G. Alexander, 2996 Bedford Ave., Brooklyn, Archt.

N. Y., Yonkers—Otis Elevator Co., 11th Ave. and 26th St., awarded contract for a 2 story factory at Wells Ave. and River St. here. Estimated cost $200,000.

N. C., Gastonia — The Ferguson Gear Works Inc., 519 North Airline St., manufacturers of gears and similar industrial equipment, plans a new plant including shops, etc. Estimated cost $25,000.

O., Canton—Ohio Builders & Milling Co., 802 Navarre Rd. S. W., plans to rebuild 1 story garage recently destroyed by fire. Estimated cost $40,000.

O., Bellefontaine — Cleveland, Cincinnati, Chicago & St. Louis Ry. Co., 230 East 9th St., Cincinnati, plans the construction of locomotive repair shops here. Estimated cost $150,000. H. Baldwin, Ch. Engr.

O., Cleveland — The Otis Steel Co., Jennings Rd., had plans prepared for a 1 story, 163 x 252 ft. open hearth furnace building at 601 Clark Ave. Estimated cost $500,000. Private plans.

O., Zanesville—Federal Radiator & Boiler Co., plans the construction of a new unit to replace fire loss. Estimated cost $50,000.

Okla., Oklahoma City—Sherman Pipe Co., 2100 East 10th St., had plans prepared for the construction of a factory. Estimated cost $50,000. Private plans.

Okla., Ponca City — E. W. Marland, is having plans prepared for a 3 story, 100 x 150 ft. garage on Grand St. Estimated cost $250,000. Smith & Senter, Archts.

Pa., Philadelphia—Brown Instrument Co., Roberts and Wayne Sts., awarded contract for a 2 story, 40 x 60 ft. factory. Noted Feb. 23.

Pa., Philadelphia—Nice Ball Bearing Co., 30th and Nicetown Sts., awarded contract for a 1 story, 65 x 180 ft. addition to factory.

Pa., Reading — Reading Co., Reading Terminal, Philadelphia, will soon award contract for a 1 story, 22 x 61 ft. welding shop at 6th and Pike Sts. here. C. Dillenbach, Engr.

R. I., Providence—Jewelers Supply Co., Garnet St., awarded contract for a 2 and 3 story factory at Eddy and Ernest Sts. Noted Feb. 2.

Tex., Harlingen — M. A. Munday, will build a 2 story, 100 x 140 ft. garage and sales building. Estimated cost $70,000. L. De Guerin, Engr.

B. C., Vancouver — Lions Gate Garage Ltd., is having plans prepared for a 5 story, 100 x 120 ft. garage at Hornby and Dunsmuir Sts. Estimated cost $250,000. Townley & Matheson, 325 Homer St., Archts.

Ont., Port Arthur — Kam Motors Co., plans the construction of a 2 story garage. Estimated cost $50,000.